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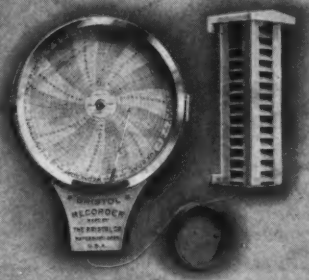
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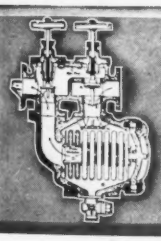
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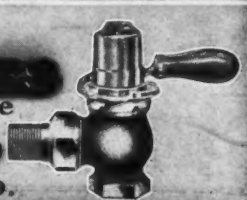

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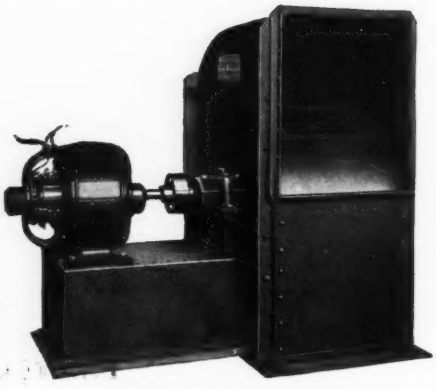

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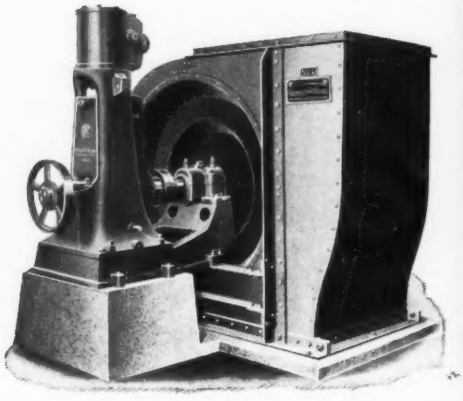

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THE HEATING AND VENTILATING MAGAZINE

OCTOBER, 1919

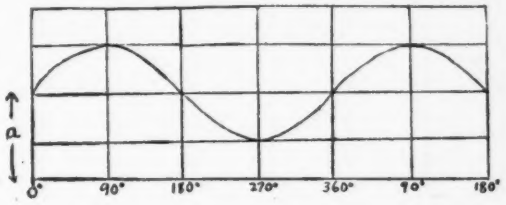
FORECASTING HEATING LOADS

How Normal Outdoor Temperatures May Be Used to Determine Most Economical Equipment

BY WILLIAM B. CAMPBELL,
Research Department, Harrison Safety Boiler Works.

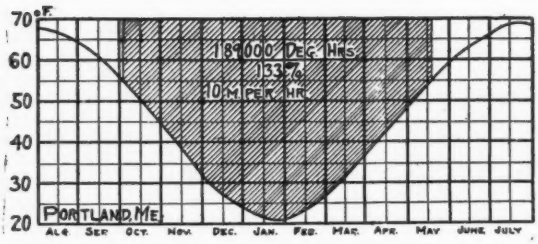
The whole science of heating has developed from the endeavor to eliminate or minimize the unfavorable effect of the weather on our indoor activities, and the intelligent consideration of heating problems involves the study of the laws which it follows, in spite of its proverbial variability. While it is impossible to predict daily variations, Government records extending back for long periods show that for a particular location there is for each day in the year a "normal" outdoor temperature, above and below which the observed temperatures range, and which remains the same if averaged over a period of years, regardless of whether it represent a group of recent observations or some of the earliest in the history of the Department. The curved lines in the charts accompanying this article represent the annual range for these normals for a number of American cities, the ordinates indicating the normal temperatures, and the abscissae dates. Each space between the heavy vertical lines stands for the month indicated, the middle of the month being shown by a light line, so that particular dates are easily estimated.

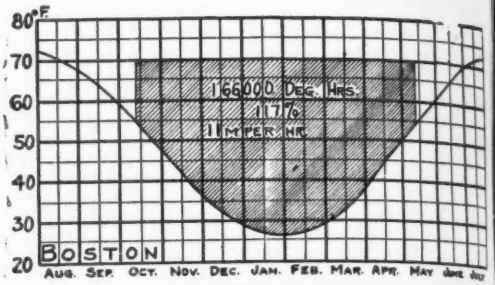
It will be noticed that these curves assume the general form of the sine curve: $y = a + b \sin x$. The date in January, where the lowest point is reached corresponds to 270° F., whose sine is —1, the peak in July corresponds to 90°, whose sine is +1, the midpoints in April and October represent 0° and 180°, where the sine is 0. The constants, a and b, have different values for each particular curve, a representing the median normal, and b the maximum divergence (plus or minus) from this median.

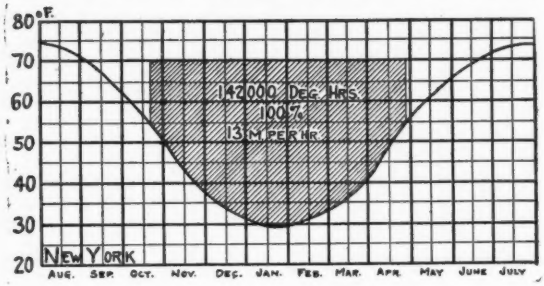


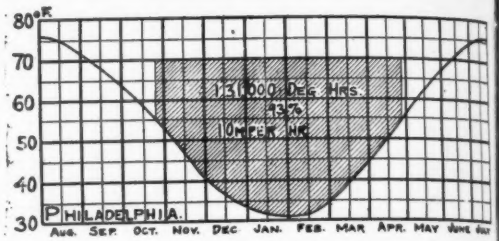
STANDARD "SINE CURVE" WHICH TEMPERATURE CURVE RESEMBLED.

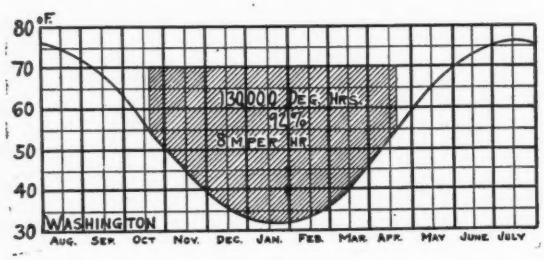
The heating of buildings is a matter of maintaining the necessary temperature difference between the temperature prevailing outside and the desired inside temperature, generally 70° F. The accumulated heat from the sun's rays, human animal heat, moving machinery, etc., tends to maintain this temperature inside the building, protected from outside winds, when the

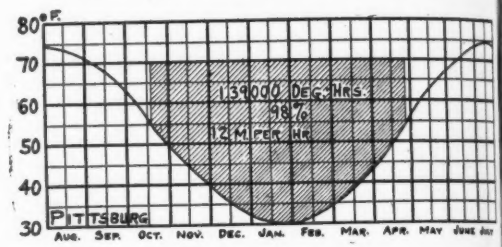


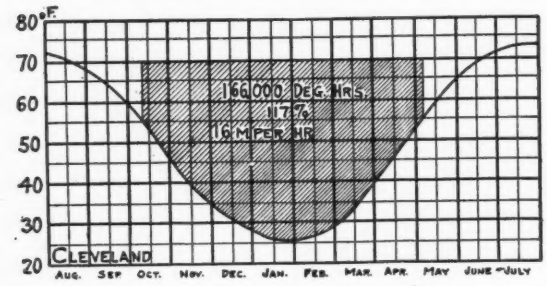


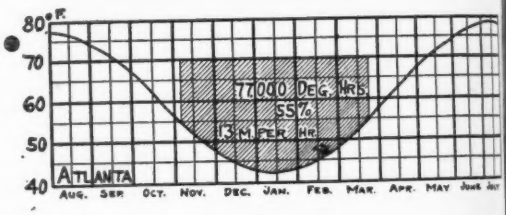


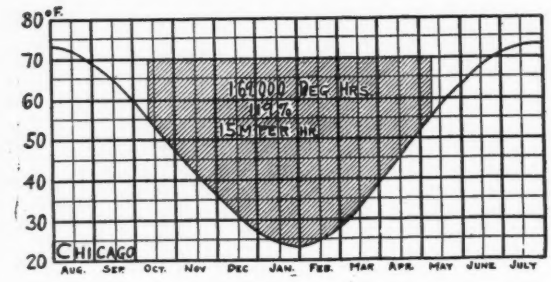


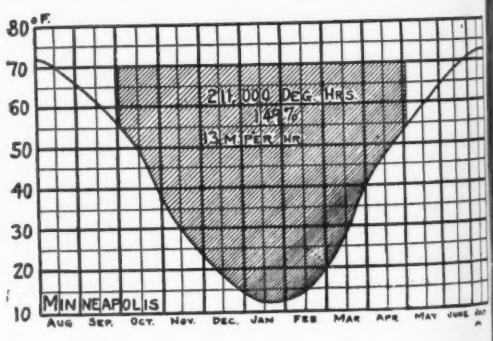




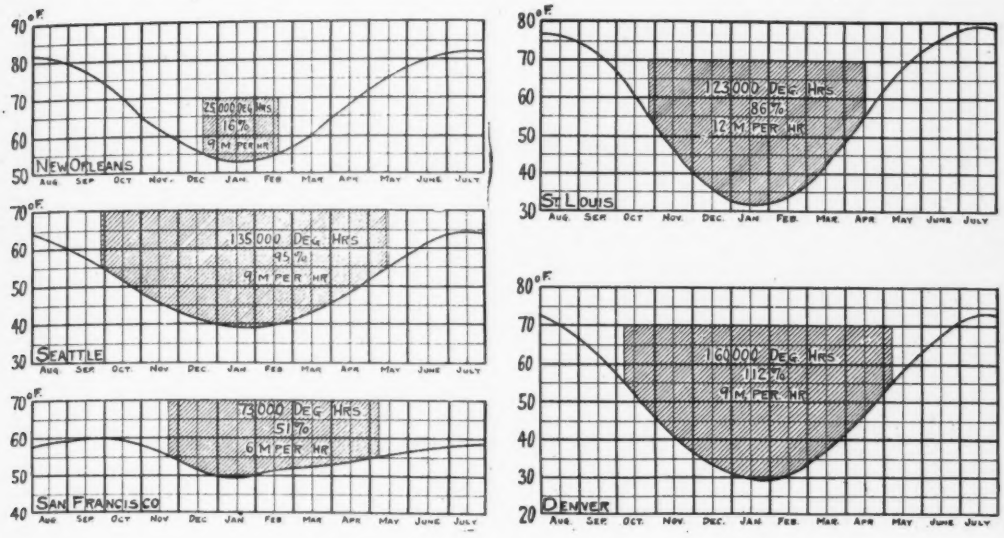








ANNUAL RANGE OF NORMAL TEMPERATURES IN AMERICAN CITIES.



ANNUAL RANGE OF NORMAL TEMPERATURES IN AMERICAN CITIES.

temperature begins to fall, but when it reaches a normal of 55° F. outside, artificial heat becomes necessary. This fixes the normal length of the heating season, which differs widely, being from December 20 to February 20 in New Orleans and from October 3 to May 3 in Minneapolis. The normal heating load is a function of the distance 70° is above the curve for the central portion of this period.

Prudence indeed will dictate, in designing a heating equipment, that it be physically capable of keeping the building warm on the "coldest day on record," even though this may mean a temporary overload and waste of fuel, but it does not pay to install extra radiators and steam equipment just to provide for operating economically at an energy which occurs once in two or three years. The question of whether the building is to be occupied by the owners or by "finicky" tenants who demand full heat every day in the year, serves to fix the "factor of safety," that is, the allowable amount the capacity of the heating system may fall short of providing 70° in exceptionally severe weather. The minimum atmospheric temperatures can always be ascertained from the local weather bureaus.

LOAD WHICH PLANT MUST HANDLE AT MOST ECONOMICAL RATE.

The temperature difference in the trough of the curve is however the criterion for normal operation of the plant, and the equipment must handle that load at the most economical rate, in dollars per day. The heat to be supplied is a function of the temperature difference times the "per-degree" losses, figured for the different exposed areas of the buildings, according to their construction and position. The amount of radiating surface to be installed is that which will give out the necessary heat from a circulating medium at the most economical temperature. A comparison of the heating load with the anticipated light and power load makes it possible to determine, on an economy basis, whether it will pay to generate power in the building, using the bulk of the exhaust to heat the building in the water, and the remainder for heating boiler feed-water. The same consideration will determine the capacity of the engines and boilers installed, it being recognized that an equipment that will carry the normal load at maximum economy will operate some-

what over or under load and still maintain a good degree of economy.

HEATING LOAD A MATTER OF DURATION, AS WELL AS OF INTENSITY.

The heating load is not only a matter of intensity, but of duration, and the total heat to be supplied during the year is represented by the shaded areas above the curves. These are expressed in "degree-hours," each of these units representing the maintenance, for an hour, throughout the building, of a temperature difference of one degree between it and the outside air. 1,000 deg.-hrs. represents the maintenance of 40° temperature difference for 25 hours, or 20° difference for 50 hours. The total heat to be supplied during the year will be the temperature loss from the building "per degree per hour," multiplied by the number of degree-hours, and the fuel consumption will be proportional thereto.

PRACTICAL USE OF "NORMAL" TEMPERATURE DATA.

Probably the most satisfactory results from such data are of an empirical nature. That is, it is possible to compare a projected operation with an existing building of a similar construction in another city. This eliminates all uncertainty as to transmission coefficients, and puts the problem purely on the basis of a comparison of the relative amount of heat consumed by the two environments. The mid-season normal heating load can be compared, the length of heating season, and even the total load, which will be a gage of the total coal required, and other heating equipment charges to be included in the estimated rentals. For purposes of comparison, these degree-hour loads have been reduced to a percentage basis, with New York as a standard, the relative loads of the cities represented being as follows:

	Total heating load	Lowest normal temperature
	Per cent.	Deg. F.
Minneapolis	149	12
Portland, Me.	133	21
Chicago	119	23
Cleveland	117	25
Boston	117	26
Denver	112	29
New York	100	29
Pittsburgh	98	30
Seattle	95	39
Philadelphia	93	31
Washington	92	32
St. Louis	86	32
Atlanta	55	42
San Francisco	51	49
New Orleans	16	53

Seattle has a rather large load, considering its high minimum normal, 39°. This is due to the length of the season, the Pacific Coast cities showing the least range in normal temperatures, and the flattest curves. The figures on the charts below the percentage loads represent average wind velocities, in miles per hour, which also affect heat loss from high buildings very materially.

Similar curves are easily plotted for a large number of places, the above having been selected to show the range in typical business centers.

ROOSEVELT HALL, LOYAL ORDER OF MOOSE, MOOSEHEART, ILL.

NOVEL ARRANGEMENT FOR HEATING AND COOLING AN AUDITORIUM

Details of Installation at Roosevelt Hall, Mooseheart, Ill., Headquarters of Loyal Order of Moose.

The Loyal Order of Moose is a fraternal order seeking the cultivation of individual purity of mind and body. It aids the unfortunate and dependent among its membership and points the way to progress in life's affairs by educating its children and requiring each member to "do a little good to someone every day."

In carrying out these precepts the organization, acting on the advice of its director general, James J. Davis of Pittsburgh, and its supreme secretary, Rodney N. Brandon of Mooseheart, Ill., together with other counselors, has not only established friends and membership to the extent of possibly two million people both in this country and abroad, but has also acquired buildings in a number of cities for the transaction of the business of the order.

Its property at Mooseheart, including the headquarters of the order and its chief industrial establishments, comprises some thirteen hundred acres of land situated on the Fox River, about one and one-half hours' ride from Chicago. On this property there has already been erected some thirty substantial buildings such as dormitories, cottages, schools, industrial buildings, farm buildings, printing and other establishments which are all supplied with light, heat, water and power for its industries from its own central station plant.

"Roosevelt Hall," dedicated June 20, 1919, follows the general character of construction previously adopted in the

use of granite-faced walls, surmounted by a red tile roof. The basement is used for store rooms, bakery, barber shop, kitchen, dining room, shoe shop and sewing rooom, etc. Above the basement and flanking "Roosevelt Auditorium" on two sides are domitories fully equipped with modern devices such as may be found in any private home, which are for the use of one hundred children inmates.

The auditorium, in the central part of the building, seats about 1,100 persons. It is used daily by the self-governing student body, which, under the leadership of Superintendent Matthew P. Adams, discusses topics of the day and awards its members such merit or demerit as the previous day's experience may have suggested.

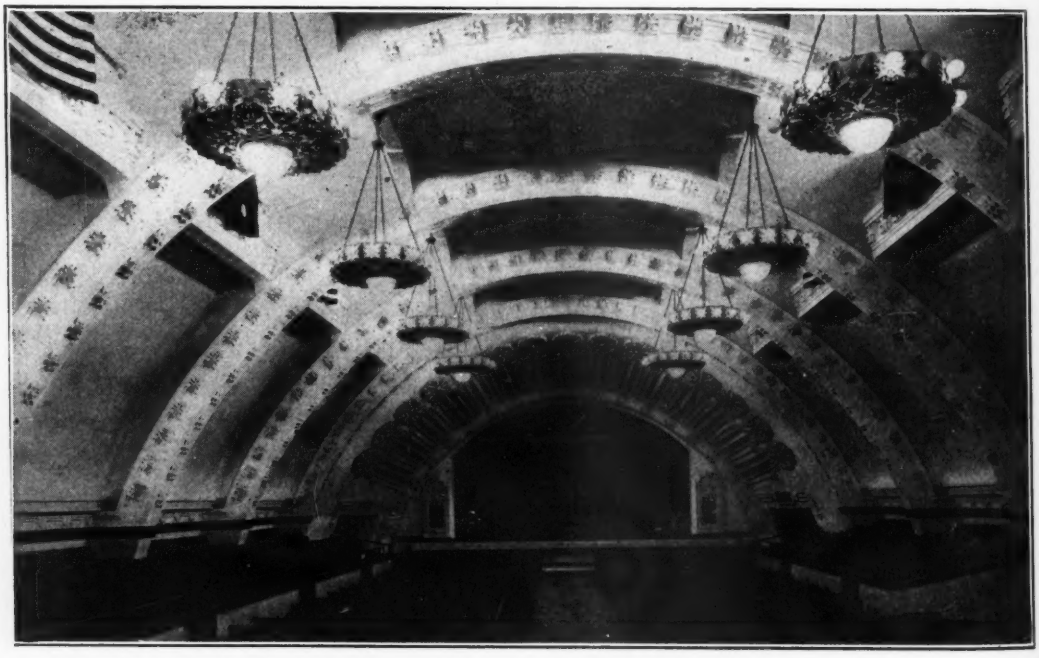
The auditorium is also used for concerts given by the Moosheart Philharmonic Orchestra led by Prof. Gullotta, or it may readily be converted into a complete theatre with stage, scenery, dressing rooms, drop lights and all accessories. It may also be used as a lodge room or a picture theatre, in which case the raised seats on the side give the smaller students full opportunity to see and be seen. By removing the seats on the main floor and the canvas covering, a welwaxed dancing floor is at the disposal of those desiring that form of entertainment.

The arched steel and lattice work of the ceiling is covered with wire lath and hard plaster, from which an ornamental series of basket electroliers are hung at proper intervals.

The ornamentation consists of interwoven cubes, oblongs and prismatic figures, made and erected by the Mooseheart Plastic Art Works. The lighting consists of globes surrounding the electroliers and a double row of lamps concealed on the side walls. A panelling of imitation Sienna marble (also produced at Mooseheart) is installed in the entrance. The color scheme is white with an occasional tint of yellow, all harmonizing with the marble and furniture in such manner as to command the attention of all those who enter the structure.

HEATING AND VENTILATING EQUIPMENT.

As the various use and conditions of heating and ventilating service have required a rather unusual arrangement of apparatus, the following general description and diagrammatic illustrations will be found interesting.



INTERIOR OF ROOSEVELT HALL, SHOWING CEILING AIR OUTLETS.

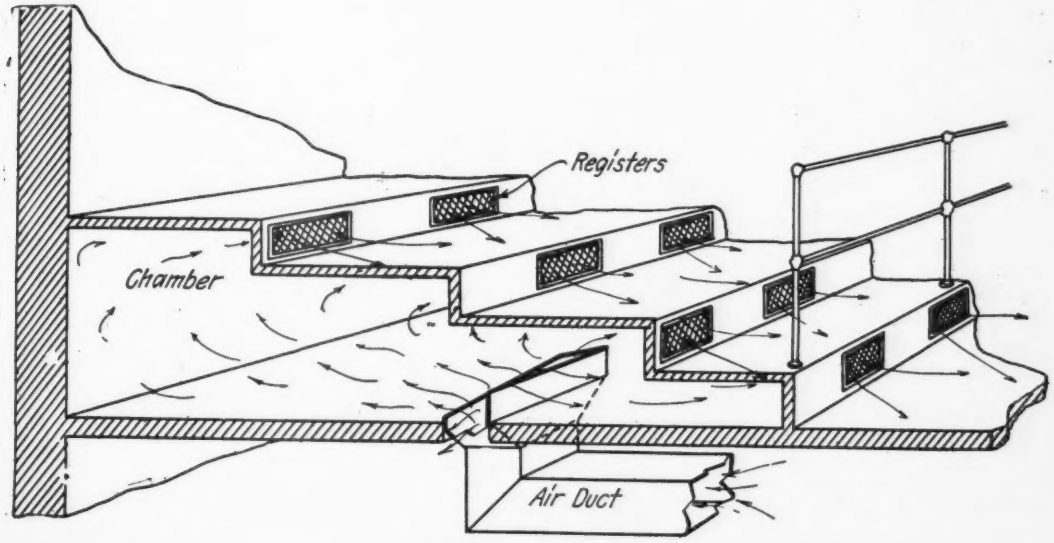
Dormitories. The two dormitories are heated by indirect radiation on a "Crescent" vacuum system using the otherwise waste steam from the power house engine, which is conducted through a special system of piping to insure the separate heating of the building in case of a rupture of service on the main heating lines.

Basement and Stores. These departments are also heated in the same manner as the dormitories and also ventilated by admitting air from the fan system sufficient to insure proper circulation. There is also provided an auxiliary high-pressure line connected to the cooking apparatus in the kitchen and duplicate hot-water tanks of a capacity to serve 400 persons in the various parts of the entire building; the return from all heating apparatus being brought back to the boilers.

Auditorium. In order to preserve the architectural and decorative designs of the interior, and having in mind the fact that the larger part of the main floor was to be used for dancing, both heat and ventilation are furnished to the auditorium from a fan room located in the basement as shown on the drawing.

Fan Room. There is installed in the fan room five section of 72-inch Vento steam coils, an air washer and fan which are operated by electricity from the power house, the capacity of which is approximately 36,000 cu. ft. of air per minute.

This purified and warmed air is forced through sheet-iron ducts below the floor of the auditorium, then up and into a series of chambers formed under the elevated seat platforms that surround the main floor of the auditorium, from whence it is diffused to all parts of the hall through registers located in the risers of the platforms and is finally discharged through a series of openings in the ceiling.



AIR INLETS TO PLENUM CHAMBERS, ROOSEVELT HALL, SHOWING ALSO LOCATION OF BALCONY REGISTERS.

Temperature Regulation. For the purpose of furnishing temperature regulation and some heat when the hall is unoccupied, a series of wall radiators is installed below the roof windows, all of the radiators being connected to one supply and return pipe and a single vacuum trap. On the supply line is connected a "Crescent" temperature control apparatus which automatically admits steam to the radiators and balances the heat requirements at all times, besides overcoming losses from the upper windows and roof.

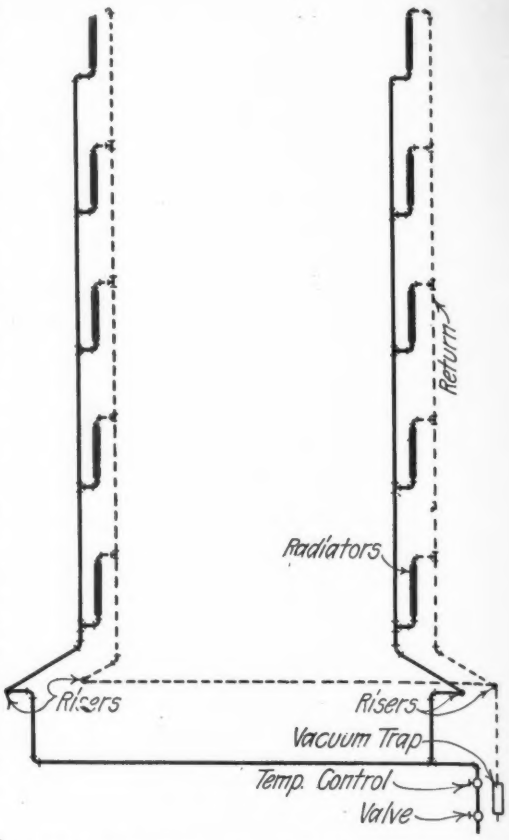
Water Cooling. Taking advantage of the fact that an abundance of cold water from a deep well was available for the pumping, the engineers pro-

vided a set of pipes by which the steam coils might be cooled instead of heated, which has resulted in a differential of about 12° below an actual temperature of 94°, thus providing a large measure of comfort to a hot weather assemblage.

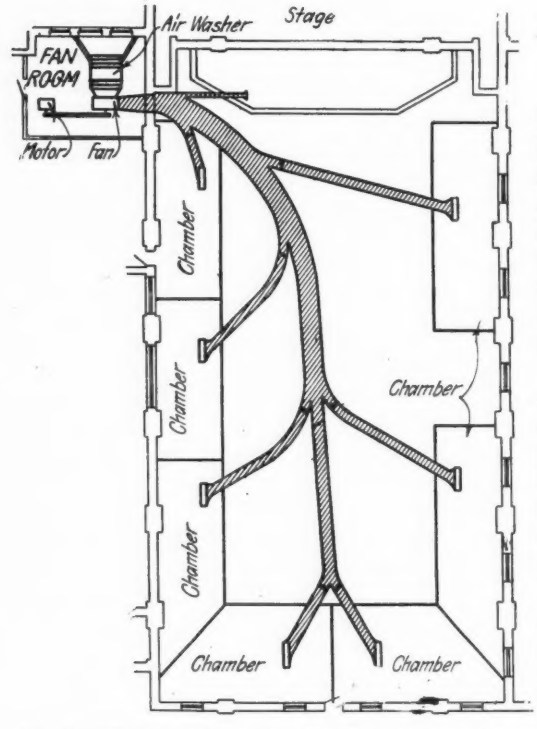
Stage and Dressing Rooms. In order to accommodate rehearsals of the Mooseheart Student Band, whose music room and dressing rooms are below the stage, a separate system of indirect radiation is used, together with a combination of natural and forced circulation. Thus, without fully heating the auditorium proper, rehearsals for plays and of the band may be held at any time desired.

Safety. Although the structure is fireproof throughout, all pipes—while concealed from the interior—are readily accessible and so supported as to be independent and removed from stage scenery, electric wires and other causes of danger, thus adding to the architectural features an additional and commendable measure of safety.

The heating and ventilating system was designed and executed by W. H. Pearce & Co., engineers, of Chicago, Ill., who previously executed the construction of the central heating plant and other work now in service at Mooseheart. The architectural plans were furnished by Knox & Elliott, of Cleveland, O., and the governors were represented by R. F. Havlik, resident engineer, of Mooseheart.



ARRANGEMENT OF AUXILIARY HEATING SYSTEM, ROOSEVELT HALL.



AIR DISTRIBUTION SYSTEM, ROOSEVELT HALL.

At the recent convention of the order and after some new buildings were ordered constructed from the general funds, John W. Ford, a well-known Philadelphian, as leader of a delegation from that city, presented the institution with funds for a complete new hospital.

Not to be outdone by this mark of appreciation of the work already done at Mooseheart, the delegates present, led by Governor Lowden of Illinois, Governor Arthur Capper of Kansas, Hon. E. J. Kenning of California, Hon. John Lentz of Columbus, O.,

Prof. Albert Bushnell Hart of Cambridge, Hon. Mahlon Garland of Pittsburgh, Pa., and others, personally subscribed a sum of money sufficient to guarantee the construction of a house of worship to be erected in the near future.

It was also agreed that inasmuch as the substantial character of the hall occupied, its varied applications and general beauty of design exemplified the life and character of one of America's most loyal and distinguished citizens, and a member of the order, the building hereafter should be known as Roosevelt Hall and Auditorium.

BUILDING CONSTRUCTION UNDER THE COST-PLUS-FIXED-FEE CONTRACT

Cooperation Among Owner, Architect and Builder Insured by New Form of Building Contract.

BY A. E. WELLS.

President, Wells Brothers Construction Co., Chicago.

If a half dozen street urchins are caught by a burly representative of the law while engaged in the pastime of shooting craps, the law against gambling acts. Law makers have recognized that gambling is an unnecessary evil and have, so far as possible, put a stop to it.

Yet an owner and a contractor can gamble with a million times the stake of the street urchins without fear of the law and it is done constantly under the guise of the lump-sum contract.

For under its terms the contractor agrees that for a certain sum of money he will guarantee the owner against all the unknown conditions involved in putting up a structure. Whether he makes his figured profit or whether he loses so heavily as to be put out of business rests partly on his ability to figure costs but largely on his luck in failing to meet those conditoins which would increase costs.

Both parties to this contract stand to gain or lose. If the job costs 20% more than estimated the owner gains to the other's loss. If conditions make considerable saving possible, then the contractor gains to the owner's loss.

Many contractors who in times past have built extensively are no longer operating. Others have taken their places. Perhaps the majority of the missing firms are those who were expected not only to build according to specifications and within the time limit, but to gamble that their costs would fall within a fixed contract price. Gambling against variables such as the forces of nature and the conditions of labor—they lost. In many cases their failure involved an added investment on the part of the owner or possibly the surety company. It is certain that no one gained through the failure.

The contractor is an expert retained to assemble certain materials into a finished structure. The question being asked today is "should the contractor insure the owner that his structure will not exceed a definite contract price." In competitive bidding the cost of this insurance is paid generally by the low bidder out of profits, or, as frequently happens, out of his capital, for the reason that he is more likely to get the contract as he scales down his allowance for contingencies. In fact, the man whose bid includes a safe allowance for insurance against higher costs cannot expect to obtain work under the competitive bidding system. The inevitable result is the bankruptcy of many contractors and an additional cost

to the owner or the surety company to complete the unfinished contract. This situation has come to such a point that surety companies are refusing to write surety bonds on fixed-price contracts except under especially favorable conditions and they frequently recommend to owners the cost-plus-a-fixed-fee contract.

But from the owner's standpoint is it not preferable to know in advance what a certain project will cost? It is true that a careful estimate is due him. It should be made by a reliable contractor and checked by owner's architect and engineer. Such a figure should be more satisfactory than a competitive bid which does not necessarily show the cost of the building but only what some contractor is willing to gamble is the cost of the job.

An issue of bonds for an office building or other structure can as well be based upon a careful preliminary estimate in either case. It can only run below the estimate under the cost-plus-fixed-fee plan. Is not the owner entitled to the possible saving?

Additional financing may be an unfortunate necessity but is there reason why the contractor should be asked to underwrite the accident of greater cost?

PRACTICE OF CONSTRUCTION DIVISION, U. S. ARMY.

At the Chicago meeting of the Associated General Contractors of America, November 21, 1918, this topic was discussed and Brigadier-General R. C. Marshall, Jr., chief of the construction division of the U. S. War Department, pointed out the fault of the usual pre-war basis of contract. He showed the impossibiltiy on recent War Department work of asking for competitive bids, because speed was the essence and detailed plans and specifications were never complete at the time when construction must start. On such work it was, therefore, out of the question for a contractor to bid on a flat-contract-price basis. It would not have been fair to either side. As a result there was developed a form of contract known as the cost-plus-sliding-scale-fee contract.

General Marshall said that early in the spring of 1918, the program of work before the construction division was so extensive that it seemed advisable to have the merits of this form of contract again passed upon and a committee of eminent business men unqualifiedly endorsed this form of contract. In General Marshall's own words at the convention of general contractors:

"No contractor should be called upon nor permitted to undertake the performance of any contract that within the four corners of the paper upon which it appears is, or may be written the financial bankruptcy of the contractor. It is unjust, it is inequitable, it is uneconomic. The great lesson of this war on the subject of the relationship between the contractor and the owner is the 'cost-plus' contract. This represents the only equitable basis under which a contractor may perform constructive and economic services for the owner. It is the only form of contract which affords protection to both parties. To me all the energies, the thought and the experience of this country within its own continental lines during the past year and one-half of this world struggle shall have been in vain unless out of it shall grow, as a permanent institution, solidifying the economic relationship between the contractor and owner, the 'cost-plus' contract."

SUCCESS OF PLAN BORNE OUT BY EXPERIENCE.

We have been operating under this plan almost exclusively for several years. We know that it is possible to convince most business men of the perfect fairness of the "cost-plus" contract and among our clients are several who would be the last to tie themselves up with us on any basis of contract likely to be unfair or dangerous. We have built on this basis for Montgomery Ward & Co., four successive times; for the Robert Simpson Co., Ltd., Toronto, five separate buildings and for the William Davies Company, Ltd., Toronto, six buildings. For these firms we have been able to start actual construction much earlier than otherwise would have been possible, which means early occupancy. The reason for this is that we

can start the foundations just as quickly as the foundation plans are complete and further design and construction may go on incidentally.

REDUCING THE TIME MONEY IS TIED UP DURING CONSTRUCTION.

Money tied up during construction earns nothing until the building is ready for occupancy and the interest often amounts to a considerable sum. When we have opportunity to work with the owner, architect and engineer from the very inception of plans and when we begin foundations as soon as the general contour of the building and equipment are determined upon, we are able materially to cut down the period during which the owner's capital is unproductive. Under the lump-sum contract it is necessary that the plans be complete before bids are taken, which may delay occupancy for months, and without occupancy a building investment is poor as a dividend producer.

But while speed is of first importance in most building contracts, yet fairness to both parties is an equally good reason for its general adoption and on that basis our company is now operating almost exclusively. We feel that the owner should reap any benefit we are able to bring about. To give us incentive to make such savings we ask a moderate percentage of that saving under the estimated cost. Our standard contract calls for a return to the owner of 90% of such savings, all of which would have accrued wholly to the contractor under the lump-sum plan. We believe 10% of the savings to be an adequate incentive for the contractor. We have almost invariably made savings for the owner below the estimated cost on our "cost-plus" contracts and such savings have not been through the padding of preliminary estimates but through changes or economies in construction made with the consent of owner, architect and engineer, which produced either a structure more adaptable to its purpose or of lower cost with equal value. Such changes could be made only with difficulty under the lump-sum contract, as the average owner is averse to changing original specifications because of the generally high cost of "extras" or divergence from the original basis of bidding.

The cost-plus-fixed-fee basis has been adopted for the major manufacturing and merchandising operations. Automobile makers do not gamble with a fixed price but from season to season vary their selling price according as costs rise or fall. There is less of general price advertising than before the war and now many standard articles of commerce, once fixed as to price like the Ingersoll dollar watch, are to-day on a new basis and to-morrow may be higher or lower, according as costs dictate.

Unquestionably the contractor is called in because he is an expert in building and not to absorb the risk entailed in the lump-sum contract. If it is not the purpose of the owner to buy price insurance along with his building then cost-plus-fixed-fee is a better basis.

In response to an inquiry addressed to Mr. Wells by the *Warm Air Heating and Sheet Metal Journal* as to whether sub-contracts were awarded on the "cost-plus" plan, or a fixed price required before awarding such contracts, Mr. Wells stated:

"The fact that in many branches of sub-contract work a considerable portion of the materials are fabricated in shops (in many cases hundreds of miles from the building) makes it a difficult matter to let this class of contract to sub-contractors on a fee basis. Many branches, however, are being performed on that basis.

"Under our 'cost-plus' plan, we make an approximate estimate for the architect and owner from preliminary plans, which is checked in detail by them. From this they can judge whether our allowances are adequate for the various branches. As soon as the plans and specifications are ready, we agree with the owner and architect upon a limited number of sub-contractors in each branch to be invited to estimate. It is understood that only sub-contractors invited will be accepted if their figures are satisfactory.

"There is no cut-throat competition

among sub-contractors; our architects and owners agree with us in the willingness to pay an adequate price for the work. An owner will not let the general contract on a 'cost-plus' basis if he has any desire to saddle a loss on those doing the work."

REMODELING A HEATING SYSTEM

Changes Made in Plant of Brooklyn Standard Union Building to Secure Greater Economy and Efficiency.

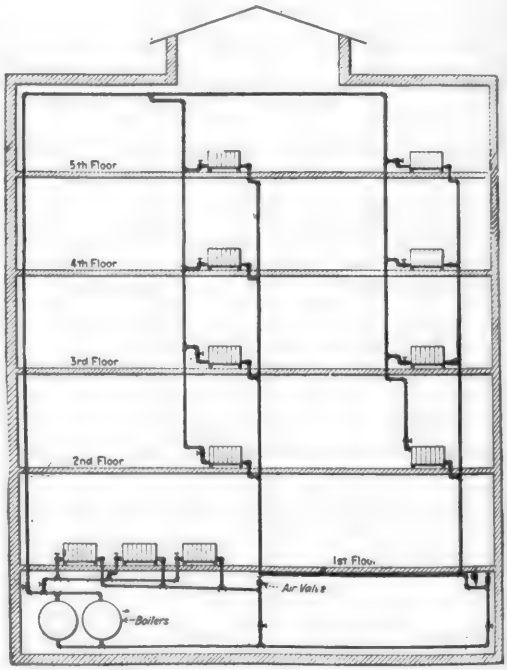
BY HELEN R. INNIS.

(Presented at Meeting of American Society of Heating and Ventilating Engineers in Pittsburgh, June, 1919.)

The paper discussed the remodeling of the heating system in the plant of the Brooklyn Standard Union. This building is about forty years old, of brick construction, and is five stories in height, with a basement and sub-basement. It extends through the block from Fulton to Washington Streets, a distance of 90 ft., and has a 50 ft. frontage on each street. The cubic contents were figured at about 360,000 cu. ft.

So far as can be ascertained, the building was originally used as a department store and later operated as the Arlington Hotel. During these periods, it was provided with its own power plant, laundry and kitchen equipment, elevator machinery, etc., and was heated by exhaust steam from the engine and auxiliaries, supplemented by live steam through a reducing valve.

In 1902 the Standard Union took possession. They found it necessary to remove part of the basement structure in order to set up their printing presses; two large modern newspaper presses which are located in the sub-basement, and extend up through the basement space on one side, taking up the larger part of the available cellar. The installation of these presses made it necessary to remove the engine-room equipment. Therefore, the elevator was changed to electric and put on Edison service, as was also the house pump. As the boiler-feed pump was removed with the rest of the old equipment the returns from the heating system were connected directly to the boiler, with a by-pass to the sewer. Nothing was retained but two 25 H. P. horizontal tubular boilers. They were left as they were, and supplied the heating system with steam through a reducing valve. The intention was for the condensation to return to the boilers but as they were frequently operated at 20 lbs. pressure, the sewer by-pass was in constant use. The results were very unsatisfactory, but as the item of coal consumption is not very high in comparison with other operating costs in a printing establishment, and therefore not very interesting as compared to some of the



REARRANGED PIPING CONNECTIONS IN NEWSPAPER BUILDING

other possible savings, they merely patched up the system here and there, added or changed a radiator or grumbled about the lack of heat, according to the severity of the winter, and made the best of it for sixteen years.

FUEL SHORTAGE RESPONSIBLE FOR REMODELING OF SYSTEM.

It is not improbable that they would have continued this maligning of the heating equipment all winter and forgetting about it all summer, had not the war brought the Fuel Administrator. Then the severe winter of 1917, which froze up the harbor and caused Brooklyn to suffer the greatest coal shortage it had ever known, brought them up short, for they found that even though burning all the coal they could get, their heating was neither constant nor adequate. With the limiting of this coal supply to the amount necessary to heat a building of this capacity with efficient apparatus and operation, they realized they could never come through satisfactorily. The only thing to do was to remodel the entire heating system.

In going over the building prior to planning the new system, it was found that the principal source of complaint was the top floor, where the composing room is located. This floor always suffered from very cold drafts, which were especially severe from 2 to 4 p. m., when the lower doors were constantly open while the daily edition was going out. As this room was occupied at all times except Saturday night, it was decided that particular attention must be paid to the needs of his floor. On the first floor was located the office of the New York World. It was occupied at all times, and required heat until late at night. This was another particular point for consideration.

DETAILS OF OLD INSTALLATION.

The principal part of the old installation had been a two-pipe system with air line, with down-feed risers. From the appearance of some of the old piping in the centre of either end of the building, it had evidently been considered necessary at some time to intsall additional radiation for this portion, and it had been made one-pipe. Still later some one in authority had apparently given orders for several radiators to be installed in a hurry, and four of 90 sq. ft. each had been connected on the second floor to the most convenient spots in the piping.

The radiator valves also showed a variegated assortment. Some were angle, some globe, and some globe valves, handle up, were even connected to one-pipe radiators. There were some old style automatic air valves, some fairly modern, and some ordinary pet cocks. The air valves that were not connected to the air line either vented into the rooms or were connected into sewer pipes and vents. Leaky air valves, leaky stuffing boxes, and porters draining radiators now and then into buckets had all left their traces in damaged ceilings and floors.

The problem was to transform this into an up-to-date system, at a moderate cost, and without interfering with the activities of the plant. As usual, although the question came up in ample time, the actual signing of the contract and the starting of the work did not take place until the heating season of 1918 had come. The owners and occupants were pleased at the prospect of an air-return system with but one hand-operated valve on each radiator.

HOW THE SYSTEM WAS CHANGED.

It was somewhat puzzling to decide upon the preferable plan or scheme for the combining of the old and new systems of piping. The old two-pipe down-feed system, which supplied the second to fifth floors, had very small steam risers. The main supply riser was especially small. Therefore, it was decided that if two new 3-in. supply risers were run to the top floor, one at each end of the building, and there connected to such old mains as could be used, and new ones where necessary, it would be a satisfactory solution. New reutrn risers were planned to take care of the old one-pipe radiators, and new steam and return risers for the new radiation.

As it was practically impossible to change much of the piping that ran over the presses, the old cellar main and return were left to take care of

the first-floor radiation. In view of the fact mentioned earlier, that this floor needed heat at unusual times, this worked out very nicely. It made an entirely separate run of this first floor, and when heat was needed only in this portion of the building, it was possible to supply it with the fires banked. The first and most direct supply of steam would also be to this floor, and to the top floor, the most used parts of the building.

CHANGES MADE IN VENTILATING SYSTEM.

The press-room is heated by the uncovered steam and return mains, as well as by the boilers and the stereotyping apparatus, both of which adjoin it and are practically in the same room. The heat given off by the latter apparatus necessitates ventilation. This is provided by exhausting the air by means of ducts with a fan located on the roof. The effect of this exhaust fan is to act in opposition to the boiler draft, and it was recommended that outside openings be provided direct to the boiler room and a tight door placed between the boiler and the press-room.

Fifteen linotype machines are used in the composing room on the top floor. Each machine has a hooded connection to the exhaust system, and the fan is run continuously for the removal of the lead fumes and the products of combustion from the gas burned. The air leaking in, or coming up the stairway to supply that exhausted by the fan, more than offset the heating effect of the gas.

To remedy the rush of cold air up the stairway (as well as improve first floor conditions) the delivery room was partitioned off. In the third floor hall, where there is a window, a 100-ft, radiator was placed to heat the stairway and hall. Five new radiators with a total of 270 sq. ft. were added at different points in the composing room.

In the work of installing the apparatus, the changes in the steam connections from the boilers to the 5-in. main were made in the early heating season. The two new 3-in. main risers were then run to the top floor and plugged. The connections from the new radiators on the first floor to the supply and return mains were all made in the middle of the day when the fires could be banked. The old down-feed risers were used while the new risers were being run, and the transfer from the use of the old to the new was made a few radiators at a time. Whenever possible, all new piping was run without disturbing the old, in order that it might be used for heating. Thus the entire job was installed while the building was in constant use, without having the heat turned off.

When the plant was completed, impulse check valves had been placed on the returns of all radiators; all air valves had been removed, and the air was being vented in the cellar through large thermo-float air valves. Those venting the returns from the Fulton Street side of the building,—the western exposure—have a check valve on the outlet. When the fires are banked or the pressure falls below atmosphere, the radiators on this side of the building keep warm while those on the warmer side cool off.

The steam mains for the first floor, as well as those for the supply risers to the top floor had been separately valved, with corresponding valves in the return mains, which made possible the separate control of the heating of the various sections of the building. New return mains erected on the ceiling of the basement provided a separate system of returns for the radiation on the upper floors, as well. The boilers were being run at a very low pressure, not exceeding 1/2 lb. except in very severe weather, or for the purpose of quick heating. The circulation was complete throughout the entire system, and the operation was quick and noiseless. With a greatly reduced coal consumption, they were obtaining heat when and where they wanted it, with the possibility of regulating the amount to conform with the requirements.

Fuel Economy in Humidity Control.

A number of the Illinois State buildings are heated by fan or hot-blast systems. The average condensation in the coils per square foot of surface per hour is 1.56 lbs. when heating air from 30° to 105°, but in zero weather, heating air from 0° to 105° will condense 2.26 lbs. per hour, or an increase of 45%. It is evident that when the building is being warmed up in the morning and has few or no occupants, all the outside air should be shut off, and the air in the building recirculated by proper damper arrangement.

Modern ventilating systems are designed for delivering from 25 to 30 cu. ft. of air per minute for each occupant. This will maintain a standard of purity of the air which has arbitrarily been decided upon, but this amount of air can be reduced almost one-half before any perceptible effect is noticed on the occupants. Then, as the ventilating apparatus takes 45% more steam when the outside air is down to zero, there is no reason why the standard for purity of air cannot be reduced during this time by recirculating from one-third to one-half of the air, and taking the remainder from the outside.

From a study of temperature records of the various State institutions it is evident that one serious loss is due to overheated buildings. These records show many instances of temperatures of from 75° to 80°. Temperatures may be considerably lower if attention is given to the humidity, the moisture in the air.

In summer the relative humidity in this climate is usually 60 to 70%, and as the windows and doors are open it is the same indoors as outside. With this humidity a temperature of 65° to 68° is comfortable. In winter the outside humidity is about the same, but as the air is heated its capacity for moisture increases, so that the relative humidity is much less. In a steam-heated room it is seldom over 25% and is frequently less.

In the latitude of Chicago the average outside temperature during the heating season is 34°. To keep a room at 66° it is necessary to maintain a difference between inside and outside temperatures of 32°. With a room temperature of 74° the difference is 40°. The heat losses from a building by radiation or air changes is in direct proportion to the difference between inside and outside temperatures, so to maintain a temperature of 66° inside means a relative heat loss of 32 and to maintain 74° means a relative heat loss of 40, or an increase of 25% in the amount of heat required to maintain the higher room temperature.

The saving of heat by carrying higher humidity and lower temperature will be somewhat less than the 25%, because some steam will have to be introduced into the room to raise the humidity and only a small part of the total heat of this steam will be given up to raising the room temperature. The amount of steam admitted into the room to maintain the humidity will be small, as compared to that required to maintain the room temperature, however. A saving of, say 15% of all the steam used for heating would be worth trying for.—*F. J. McCullough before the chief engineers of Illinois State institutions.*

Wood as Fuel and How to Use It.

Everyone will recall the time during the recent war when it looked as if it might be necessary to burn wood in house heating plants, instead of coal. Such a proposition, however, is not simple as it sounds, due to the fact that it is difficult to maintain the fire without frequent attention.

The fact is that wood can be utilized to the best advantage in a house-heating plant, by burning it in combination with coal. It is advisable to throw wood blocks on the fire when the firebox is comparatively empty and cover them with coal. Much coal consumption can be saved in this way without interfering with comfort, but it is well to give the fire more frequent attention than when burning coal alone.

The check damper in the smoke pipe should also be kept open wider than when burning coal alone, as less chimney draft is needed. When wood is used alone in a heater intended for coal, it was recommended by the United States Fuel Administration that the grate be partly covered with sheet iron or fire-brick to reduce the draft.

Vast quantities of dead wood are to be found in many sections sufficient for domestic heating in those parts. During the war wood was burned to a considerable extent in coal heaters. In North Carolina, the Fuel Administration established municipal wood yards. In Tennessee war fuel companies were organized with marked success to cut and sell wood.

According to a bulletin issued by the United States Forest Service, hickory, oak, beech, hard maple, birch, cherry, ash, longleaf pine, locust and similar species have high fuel value in comparison with other woods. One cord of any of these, when seasoned, weighs about 4,000 lbs. and is the equal in fuel value to about one ton of coal. Hickory is the best wood for a coal substitute. The oaks come next and are followed in order by beech, birch and maple.

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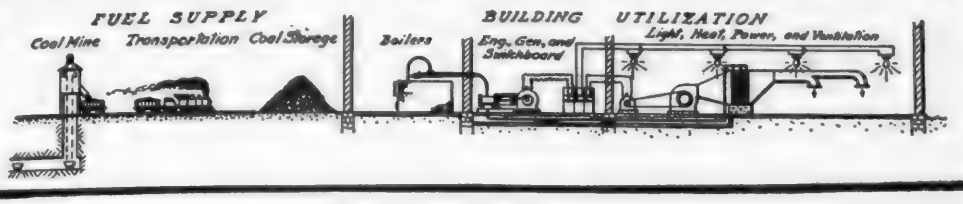
IN analyzing the high cost of living problem, the Reconstruction Research Division of the Council of National Defense suggests, as one of the most important measures to meet the situation, "some readjustment of incomes to the basis of the higher price levels." It is rather pleasant to see the word "income" used, rather than "wages," because it seems to include the salaried man who has largely been left out of consideration in the scramble of the workers for higher pay and the general acquiescence of the manufacturers in meeting them more than half way. A very natural reluctance on the part of salaried men, such as managers, salesmen, etc., to align themselves in any way with the present industrial unrest has served to deprive them of their share in the increased allowances. Not only are they not united but are so far out of touch with each other that there is no opportunity for making a concerted effort towards bettering their condition.

In the few cases where they have taken the bull by the horns, the usual answer has been that the company was considering adjustments to remedy inequalities but not necessarily to correspond with the present price levels. In the meantime there are cases without number of managers, salesmen and other salaried men who are receiving little if any more than before the present inflation of values. These men are bearing their burden grimly and at the present time their case makes the most telling appeal of any class of workers.

THE most hopeful suggestion for the solution of the living cost problem is that in which the Research Division proposes some agency for securing and disseminating knowledge of all the important facts of our economic life and progress, such as requirements, rates of production, stocks on hand, and prices. The way this information was gathered during the war period and the effect it had in promoting production and efficiency will always remain one of the country's most remarkable achievements. As is well known, when the war ended these channels of information were disconnected and the agencies in charge demobilized. The task of bringing about a readjustment of industry to a peace basis was turned over to the public with the result that the country was deprived of the most vital economic information for the coordination of production. It is not proposed to establish anything in the nature of a board of industrial control, but some agency that will secure and publish such data as (1) the record of previous consumption and the law of its variation, (2) changes in national factors tending to alter the general trend toward increasing or decreasing national consumption, and (3) calculations based upon the average requirements of the individual family. In short, a fairly definite relationship exists between an amount of finished goods and the proportionate quantities of the raw materials, labor and manufacturing equipment. Therefore, it is maintained, the estimated national needs of consumption goods would furnish a basis from which could be derived the minimum sufficiency rates of production of raw materials and capital. Protracted deficiency of production of raw materials below such rates would become at once a warning of impending shortage of corresponding consumption goods, and also a ready diagnosis of trouble already encountered.

POWER PLANT ENGINEERING



APPROVED BOILER SETTINGS FOR BURNING SOFT COAL

During the past two years a good many publications have been issued dealing with various phases of fuel economy. In fact so fast have they made their appearance that many of them have received scant consideration from the engineering public. This, of course, was partly due to the stress of war matters which absorbed the attention of most technical men and left them little time to study the measures proposed, unless they were directly concerned with the fuel conservation campaign.

One of these publications was issued by the Engineering Experiment Station of the University of Illinois under the title of "Fuel Economy in the Operation of Hand-fired Power Plants." The suggestions made in that circular to owners, managers, superintendents, engineers and firemen of hand-fired power plants, were the work of a committee of experts headed by Professor A. C. Willard, professor of heating and ventilation at the University of Illinois, and have a special timeliness just now, when predictions of another coal shortage during the coming winter are being made by those in a position to know.

In the section on "Features of Boiler Installation in Relation to Fuel Economy," some suggestions were given for the special benefit of the designing engineer.

Taking up boiler settings first, it was pointed out that a good, solid foundation on a firm footing is absolutely necessary to insure a boiler setting which will remain tight and free from any tendency to crack. The depth of the foundation and the width of the footings necessary for a given installation depend upon the character of the soil. In the case of good solid soil capable of supporting heavy loads, the excavation need not be made very deep, but where the ground is soft it is well to excavate the entire space occupied by the setting and to construct a bed of concrete about 2 ft. thick upon which the walls may be supported.

When boilers are supported on steel columns, as is usually the case with water-tube boilers and as is desirable for fire-tube boilers also, the footings at the base of the columns must be enlarged, since with such means of support the loads are concentrated and not distributed, as in the case of horizontal return tubular boilers supported by a series of lugs resting on the walls of the setting. In general, the foundation for all types of boilers should be very rigid; a weak foundation will always cause the setting to crack no matter how well the brick in the walls may be set. Weak foundations may, furthermore, tend to produce severe stresses at pipe connections to the boiler which are likely to cause trouble.

SIDE AND END WALLS.

The side and rear walls are supported upon the foundation and in the older designs of settings a 2-in. air space is generally provided in these walls. In many of the newer types of setting, however, this air space has been omitted. As a result of a series of experiments made by the United States Geological Survey, it has been found that the 2-in. air space provided in the walls of boiler settings has practically no effect in preventing the flow of heat from the interior of the setting. As a matter of fact, the radiation losses for a wall with an air space are greater than those for a solid wall.

In order to strengthen the side walls, buckstays held together by long bolts are used. The furnace, bridge wall, and all parts of the side and rear walls, including the back arch, which are exposed to the hot gases, must be lined with high-grade fire-brick capable of withstanding the high temperatures. The fire-brick should be backed with hard,

well-burned red bricks laid in a high-grade mortar. All arches, piers, and wing walls which may form a part of the combustion chamber should be made entirely of fire-brick.

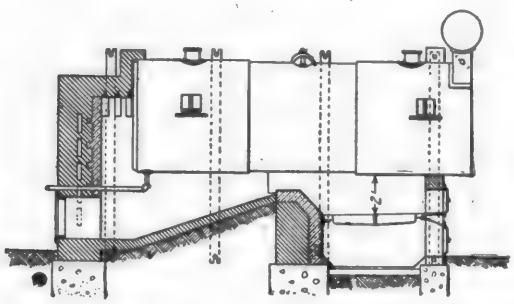


FIG. I—HARTFORD SETTING FOR RETURN TUBULAR BOILERS.

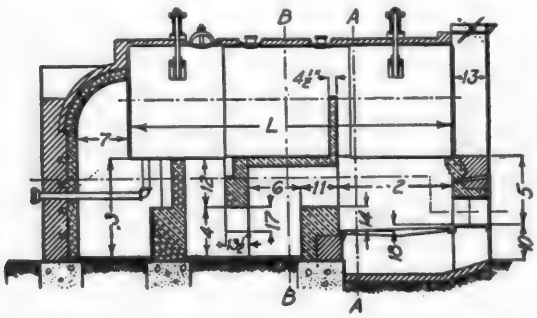
This setting does not satisfy the conditions for smokeless combustion. In fact it is, for Central Western coals, very unsatisfactory and should not be used.

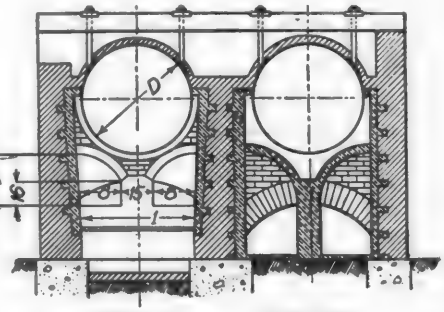
SETTINGS FOR HORIZONTAL RETURN TUBULAR BOILERS.

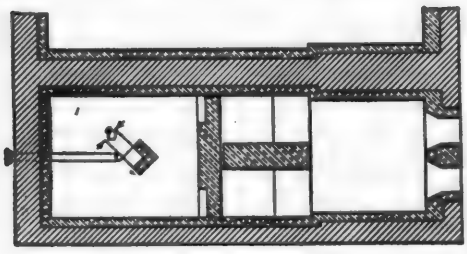
In order to use soft coal economically, it is desirable to obtain as complete combustion as possible. Complete combustion also means elimination of smoke. To obtain proper combustion sufficient air must be introduced into the furnace to supply the necessary oxygen. The air thus introduced must mix thoroughly with the gases given off by the burning coal and the mixture thus obtained must be kept at a high temperature until the process of combustion is completed. The old standard setting for return tubular boilers (shown in Fig. 1) is frequently used, but it does not satisfy the conditions stated and for this reason should not be used when smokeless combustion is required. In recent years several types of settings have been devised which, if properly fired, make possible the satisfactory combustion of bituminous coal.

A type of horizontal return tubular boiler setting which has given good results with soft coal is shown in Fig. 2. It was originated and perfected by the engineers associated with the Department of Smoke Inspection of the City of Chicago, and is generally recommended for boilers operating at a steam pressure of 60 lbs. or more. This setting differs from that illustrated in Fig. 1 in that a series of arches are constructed over the bridge wall and in the combustion chamber. A double arch rests on the bridge wall and on a suitable pier built up between the bridge wall and a single-span deflection arch, the latter being located from 2 to 3 ft. back of the bridge wall. The highest point of this deflection arch is at the elevation of the top of the bridge wall or somewhat below it. So as to prevent the gases from passing over the arches, bulkheads extending up to the boiler are constructed above them.

It is evident from this brief description







Boiler		Dimensions of Double-arch Bridge-wall Setting for Horizontal Return Tubular Boilers. Dimensions in Inches																
Diameter	Length	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
42	12	42	42	42½	27½	28	21	22	19½	15	19	18	15	16	16½	9	9	8	3½
	14		40	44	27		24			17			17		15		11		4
48	12	48	42	45½	30	30	20	24	19½	15½	20	18	15½	18	18	9	7½	8	3½
	14		40	45½	28		24			17½			17½		18½		9½		4
	16		54	49½	30		26			19½			19½		15		11½		4½
54	14	54	40	48	30	32	24	24	20½	18	22	18	19½	18	16½	13½	11½	9	4
	18		54	51	30		24			20			21½		15½		13½		4½
60	16	60	60	55½	33½	34	26	28	23½	22½	22	22½	22	18	17	13½	13	10	5
	18		66	60½	36½		26			24½			24		15½		15		5½
66	16	66	60	54½	34	34	28	28	26½	22½	24	22½	20½	18	18½	13½	11½	11	5
	18		66	59	36½		30			24½			22½		17		13½		5½
72	16	72	66	59½	37	36	30	30	29½	26½	24	22½	22½	20	18½	13½	11½	12	5½
	18		72	64½	40		30			26½			24½		17½		13½		6
78	18	78	72	65	40	38	32	32	30	27½	26	26	25	21	19	18	13½	12	6
	20		78	70	43		32			29½			27		17½		17½		6½
84	18	84	72	64	40	38	36	32	33	27½	26	26	24	21	20	18	14	12	6
	20		78	69	43		36			29½			26		19½		16		6½

FIG. 2—DOUBLE ARCH BRIDGE WALL SETTING FOR SMOKELESS COMBUSTION.

that the gases in passing from the grate over the bridge wall are divided into separate streams by the central pier supporting the double arch. In going through the retorts formed by the double arch and the side walls of the setting, the gases are thoroughly mixed and at the same time are subjected to high temperatures. Having passed through the retorts the gases are compelled to change their direction of travel so as to pass under the deflection arch back of the bridge wall, thus promoting further mixing and thereby insuring proper combustion.

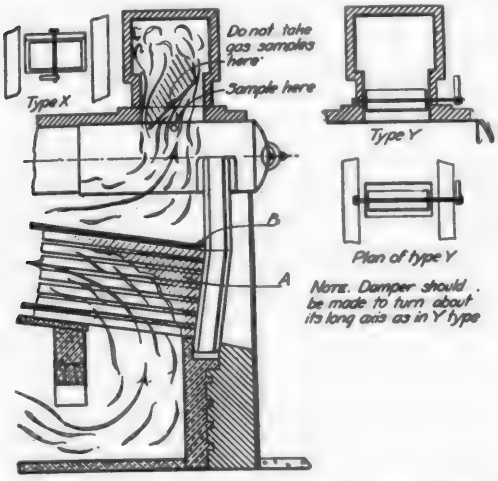

Do not take gas samples here
Sample here
Type X
Type Y
B
A
Plan of type Y
Note. Damper should be made to turn about its long axis as in Y type

FIG. 3—EFFECTS OF BAFFLING AND DAMPERS IN CAUSING POCKETS AND EDDIES OF FLUE GAS.

The setting is also provided with the usual panel door for the admission of air over the fire. The steam jets shown extending through the furnace front are generally considered standard equipment and it is recommended that they be freely used after each firing.

The arches used in connection with the setting shown in Fig. 2 produce a side pressure on the walls, and in order to prevent bulging and cracking of the walls, additional buck-stays and tie rods should be installed. The floor of the combustion chamber is subjected to high temperatures and for this reason should be paved with second-grade fire brick laid on edge.

PROPORTIONS SUGGESTED.

According to Osborne Monnett, the following proportions should be satisfied to obtain satisfactory service with this type of setting:

1. The free area through the double arch above the bridge wall should be made equivalent to at least 25% of the grate area.

2. The area from the back of the bridge wall to the deflection arch should be at least 45% of the grate area.

3. The area under the deflection arch should be at least 50% of the grate area.

There are several patented settings in which the gases are maintained at a high temperature and are thoroughly mixed by the use of piers and wing walls in place of the arches shown in the setting of Fig. 2. Experience seems to indicate that the temperatures in the combustion chamber of such settings is sufficiently high to promote proper combustion, and furthermore, it is claimed that they burn coal with good economy and are cheaper to construct than the double-arched setting.

SETTINGS FOR WATER-TUBE BOILERS.

A large number of hand-fired water-tube boilers of the horizontal type, designed for the use of soft coal, are installed with what is generally called the standard vertical baffling. This form of baffling compels the gases to pass across the tubes, thus producing a rather short flame travel in the first pass and rendering complete combustion impossible. To improve combustion in hand-fired water-tube boilers of the horizontal type when burning soft coal, it has been demonstrated by the Chicago Department of Smoke Inspection that the setting should be so arranged as to fulfill the following specifications:

1. Some provision must be made so that the bottom row of tubes will absorb heat directly from the fire. This is accomplished by the use of T-tiles, thus exposing the bottom row of tubes to the fire for a short distance from the front header.

2. Over the bridge wall and for some distance back of it a high-temperature zone, through which the gases and air pass, must be provided. This zone is obtained by using box-tiles around the bottom tubes. The box-tiles extend from the end of the T-tiles to a point several feet in front of the back header. The area provided between the bridge wall and the box-tile should be made equivalent to 25% of the grate area.

3. In order that the gases and air will thoroughly mix, a deflecting arch is provided a short distance back of the bridge wall. The distance between the arch and the bridge wall should be such that the area obtained between them is equivalent to 40% of the grate area. The height of the arch must be sufficient to provide an area underneath it equivalent to 50% of the grate area.

4. As in the case with the horizontal return tubular boiler settings, excess air is provided through the panel doors, in addition to a siphon steam jet located above the fire-doors.

When water-tube boilers are very wide, it may be necessary to construct the deflection arch mentioned in (3) in two or three spans. These spans should be supported on suitable piers in order to relieve the strain on the side walls. In case the area over the bridge wall is in excess of 25% of the grate area, the desired area may be obtained by introducing piers upon the bridge wall opposite the spans in the deflection arch. Due to these piers, the gases and air will be more thoroughly mixed, thus promoting combustion.

In water-tube boilers equipped with horizontal baffles, it generally happens that there are parts of certain tubes which are not acted upon effectively by the gases. This is due to the fact that the gases become trapped in the corners, as shown at A in Fig. 3, and become inert. Such a condition can be improved, with a gain in efficiency of the boiler, by providing openings approximately 1 in. wide in alternate rows of the tile B, Fig. 3.

THE DANGER OF AIR LEAKAGE.

One of the most serious defects found in brick settings is air leakage. The fire brick used on the interior of the setting must be selected with great care as the life of the setting very largely depends upon the quality of these bricks, as well as upon the workmanship in laying them. Generally the arches used in settings cause more trouble than any other part of the setting. In some cases arches fail because of the use of a grade of brick not suited to the purpose, but more frequently failures are due to poor workmanship in laying the bricks. Air leakage through the setting can be reduced by pointing up the brick work in the proper manner and by covering the entire setting with an insulating material, as, for example, a high grade of asbestos or magnesia covering. The exposed parts of the shell of horizontal return tubular boilers and of the steam drums of water tube boilers should be covered with an 85% magnesia covering two or three inches thick. The outer surfaces of all insulating materials should be finished off with a thin coating of hard cement or covered with canvas and painted. If the walls of the setting are constructed with air spaces these spaces should be filled with sand or ashes. The baffles on the interior of the setting should be kept tight so that the gases cannot be by-passed through the heating surfaces. All steam and water leaks around a boiler should be stopped immediately since water coming in contact with heated brick work is likely to cause rapid disintegration of the brick. The setting should be so constructed that the boiler is free to expand without affecting the brick work.

The Rapid Growth of Oxy-Acetylene Welding.

Information of value to heating engineers is contained in a readable paper entitled "The Technical Engineer's Judgment of the Oxy-Acetylene Process," delivered by Professor Alfred S. Kinsey at the annual convention of the International Acetylene Association, in New York, July 15-17, 1919. "Five years ago," says Professor Kinsey, "almost all of the leading technical engineers of the country would have advised a delayed acceptance and further study of the oxy-acteylene process of welding. Today they do not hesitate. Their minds are made up. From study and experience they speak, and because of the nature of the heat supply which can easily be made a non-oxidizing reducing flame, because of the effect of the process on the physical efficiency of the actual weld, because of the portability of the welding apparatus, and because of the economy of the process, their judgment is that the oxy-acetylene process of welding metals is an engineering success and a fine commercial asset."

Professor Kinsey, in his paper, described the development of autogenous welding since the days of the forge weld, followed by the oxy-hydrogen process. Thanks to the electric furnaces efficient method of producing calcium carbide and making acetylene a commercial possibility, the oxy-acteylene process soon superseded the oxy-hydrogen method. "From that time," he stated, "practically only about 15 years ago, metal workers, manufacturers, engineers, nearly the whole industrial world, have eagerly watched the progress of the oxy-acetylene process."

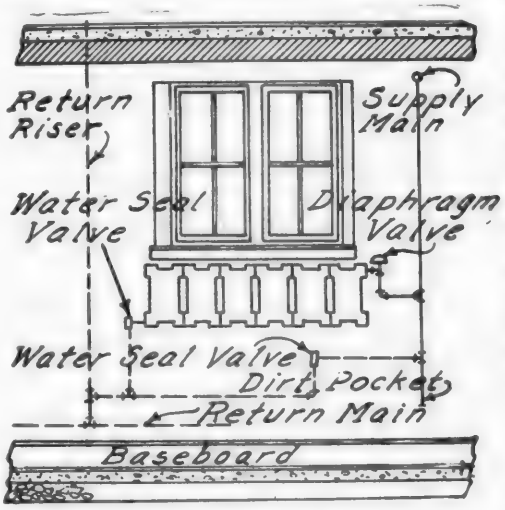
Its distinguishing feature, of course, is the fact that it accomplishes autogenous welding by fusion, whereas the old method heated the metal merely to a soft, pasty condition when it was then hammered or pressed together.

Professor Kinsey said it is now possible to secure a homogeneous weld of nearly 100% efficiency.

WRINKLES

Basement Radiator Connections.

It is sometimes necessary to connect radiators below the supply main. A method of doing this is shown in the accompanying sketch. A hand valve may be substituted for the diaphragm valve if desired, the latter being intended for use in connection with automatic temperature



METHOD OF CONNECTING RADIATORS BELOW SUPPLY MAIN

regulation systems. For the gravity system, hand valves may be substituted for the diaphragm valve and water-sealed valve, omitting also the water-sealed valve shown in the drip connection. As will be noted, the supply valve is extended below the radiator to form a dirt pocket and is dripped at this point through a water-seal valve to the return riser.

Suggestive Pipe Hangers.

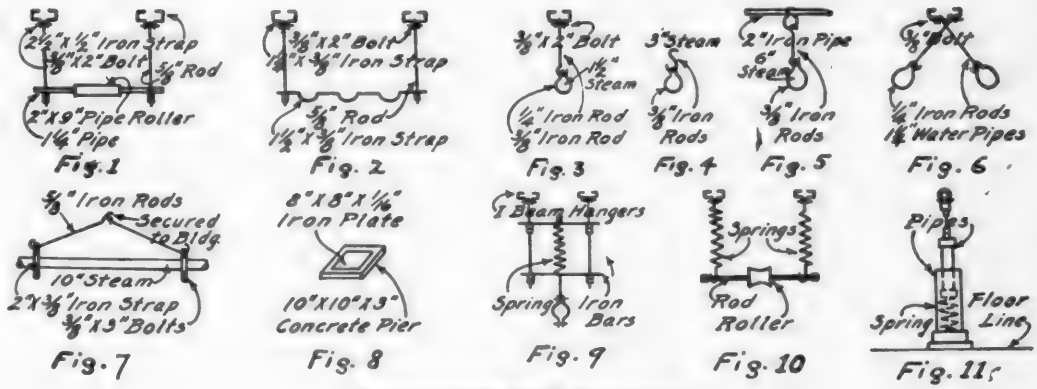
The economical design of pipe hangers has been exhaustively treated, but it is intended here to present a few simple and easily made pipe hangers, which may be suggestive to the designer of further combinations and arrangements. The designer will doubtless find in the matter of pipe hangers, that ideas will not readily come to mind when most needed. Therefore, it is hoped that the following will be of assistance.

Fig. 1 shows a form of support suitable for a 6-in. steam pipe. The pipe roller provides for expansion, in fact the entire hanger is free to swing. Fig. 2 is somewhat similar, except that a strap is placed directly under the pipes and bent to receive three pipes, say 2½-in. water pipes.

Figs. 3, 4 and 5 show the use of ⅜-in. rods bent to form S hooks and loops, the latter for the support of pipes. The S hook in Fig. 4 may be used for direct attachment to another pipe or hanger. Fig. 6 is similar, except that one pipe acts as a side brace for the other.

Fig. 7 is a method of anchoring a 10-in. steam main, while Fig. 8 shows a simple method of supporting a return main. The height of each concrete pier support is varied to suit the pitch of the pipe.

Figs. 9, 10 and 11 shows various forms of



SUGGESTIVE PIPE HANGERS.

spring hangers designed to reduce or eliminate swaying of pipe lines due to vibrations of building or machinery.

Notes on Dripping Mains and Risers.

Drips, sometimes termed reliefs, used to relieve the steam mains and vertical steam risers of the condensation which may occur in the mains, may be run directly from the main or steam risers into the return pipe, or they may be of the syphon pattern (as in Fig. 1). In that case, the pipe first drops, then rises to the return main, if the latter is overhead, or drops again to the return main if it is located below. The vertical rising piece in the syphon drip should not be less than 4 ft. in height. This drip is used to drain the end of a steam main in a vacuum return-line system. It maintains a water-seal between the steam main and return main so as to prevent steam being carried through the return main, or to prevent short circuits of steam through the drop to the return main, and thus, back to other steam or return risers. A syphon drip is but little used. The vertical rising pipe in the syphon, which, as stated, should be not less than 4 ft., must be at least 30 in. high for each pound of pressure carried on the heating system. These drips are frequently made much larger than is necessary or desirable. Ordinarily they need not be constructed with pipe over ¾-in. and rarely, if ever, should the size be over 1 in.

A valve on the riser is desirable in large jobs, particularly those in which the operation of the heating system cannot be interrupted for minor repairs above the basement. Fig. 2 shows how these may be installed, also the method of making riser and drip connections for graduation or vacuum steam systems. This method will

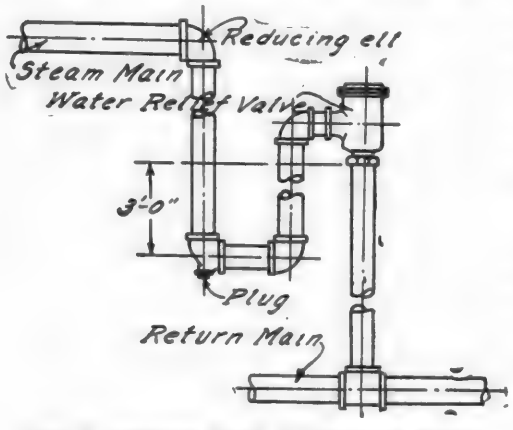


FIG. I—SIPHON DRIP AT END OF MAIN.

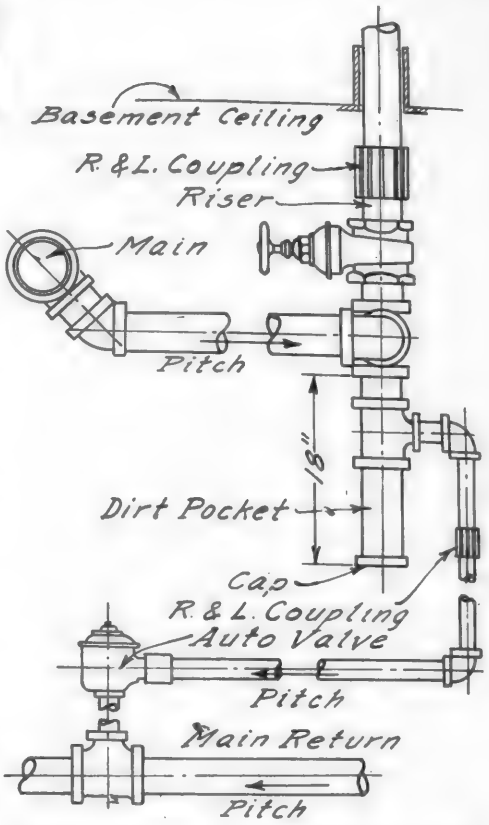


FIG. 2—METHOD OF DRIPPING MAIN AND VALVED RUNOUT.

serve equally well for gravity systems if the auto valve and dirt pocket at the foot of the riser are omitted, the drip connection being made directly from the foot of the riser to the return pipe.

A riser should not be less than the size of radiator connection therefrom. Where offsets in risers occur, the size of the pipe should be increased one size to offset the effect of the water of condensation flowing down through the pipe, and to prevent disturbance or noise. The bottom portion of steam risers over five stories in height should be increased in size to allow for additional condensation passing through the risers.

In the case of overhead systems, with down-feed risers, it is not advisable to reduce the size of the riser as the radiator branches are taken off. Such reductions, when made at the point of radiator connections, are apt to cause the water in the riser from the radiator above (together with the condensation in the riser itself) to run into the radiator, causing noise or water hammer. The lowest radiators should not be connected to the risers but

directly to the main in the basement, except that in the case of overhead distributing systems, the lowest radiators must necessarily be connected to the riser. In this case the riser should continue down into the basement full size for at least 18 in. below the lowest radiator connection, so that the water from the radiators above will not be carried into the lowest radiators. The foot of all risers should be dripped into the return main.

For the connection of branch return pipes and branches to mains in dry return systems, it is advisable to use "Y" fittings, that is, fittings in which the branch connects to the main at a forty-five degree angle thus converging the flow of steam and water in the direction of the flow. The use of such fittings will go far toward producing positive flow of circulation and the elimination of water hammer.

Methods of Installing and Protecting Concealed Piping.

Piping which is concealed, as in chases in the wall for vertical pipes, should be covered with insulating material 1 in. thick, or ¾ in. thick where the space is very limited. Expansion joints are a necessity in risers where these are concealed in high building. Doors for access should be provided opposite each expansion joint.

Where the radiator branches or run-outs must be concealed in the floor construction, special care should be used to protect the pipes and to provide for pitch and expansion without overcoming the pitch. Allowance must also be made for the expansion of risers.

The concealment of piping often involves difficulties in a modern fire-proof building, since the space between the top of the concrete slab or floor arch and the finished floor is usually very small. Provision must be made not only for the run-out itself but also for the covering. Pitch and expansion then become serious matters.

Assume a run-out of 1¼ in. for which the outside diameter is 1½ in.; also pipe covering ¾-in. thick, which makes an additional 1½ in. Further, a pitch in run-out (say 6 ft. long with ¾ in. minimum clearance at all points), make altogether 4 in. of free space whcih must be provided between the concrete slab and the under side of the finished floor. If the latter is of cement, the finished floor under the pipe should not be less than 1 in., otherwise the cement will be liable to crack.

The placing of risers, and the arrangement of branches or run-outs to the radiators from the risers, must be so arranged in concealed work as not to necessitate the crossing of supply and return run-outs in the floor structure, since there rarely will be found sufficient space for this purpose.

In general, concealed piping systems are objectionable for the reason that in case of leakage, the pipes can only be reached by damaging the walls or floors of the building. However, in the highest type of buildings the appearance of exposed pipes is objectionable and they must, therefore, be concealed. Extra care should be used in these installations and no pipes should be concealed until they have been thoroughly tested.

Vento Heater Connections for Various Types of Systems.

In Figs. 1 and 2 are shown standard methods of connections for Vento heaters when set in double height, as in vacuum systems. In gravity systems, the method of connections is the same with one exception. Check valves and hand gate valves are substituted for the dirt pocket and water-sealed valves.

In large ventilating systems, "Vento" heaters are often of necessity set in double

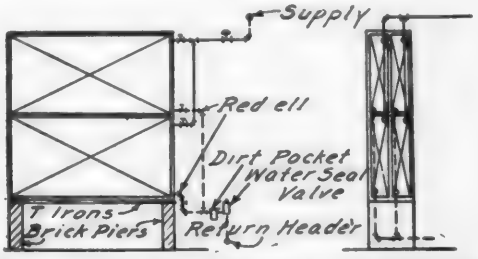


FIG. 1—VENTO HEATER CONNECTIONS FOR VACUUM SYSTEMS.

height and in double width, since not more than 14 sections wide should be connected by a single supply or return pipe. In such cases, the connections are somewhat more complicated. Methods of connections are illustrated in Fig. 2, for vacuum systems, gravity systems, and gravity systems having air-line connections, diaphragm valves being shown, assuming the use of air automatic temperature regulating system. In the case of gravity systems an additional diaphragm valve is provided in the air connection, so that the air pipe will be closed off when the steam is shut off, and thus, so far as possible, preventing air from backing into the heater. The connections as shown for vacuum systems are

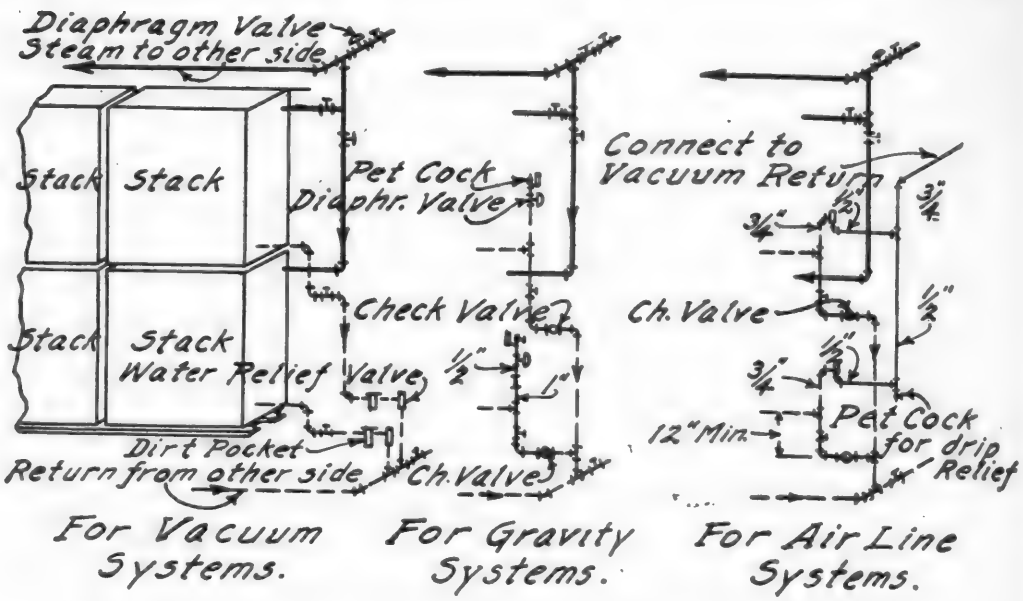


FIG. 2—VENTO HEATER CONNECTIONS FOR VARIOUS TYPES OF SYSTEMS.

suitable also for modulation systems. In the latter case, the return must be vented above the water-line resulting from the highest steam pressure.

The Alternating Receiver and its Connections.

One of the most useful devices in a heating system is an alternating receiver, connected to the main return near the boiler, as shown in the accompanying diagram. It is arranged so as to automatically equalize the return and boiler pressures in case the latter pressure should increase, tending to flood the return system. Without the use of this device, the water would not return to the boiler by gravity until a head sufficient to overcome the boiler pressure had been formed. The intermittent return of condensation would flood the boiler at times and cause an unsteady boiler line.

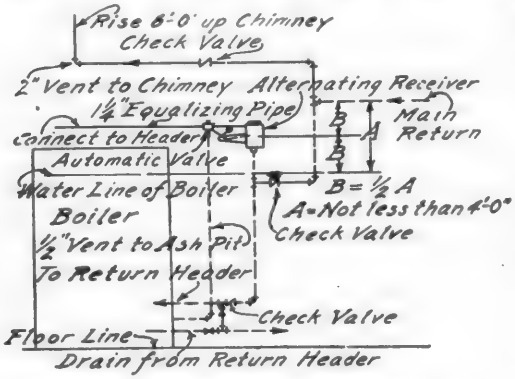


FIG. 1—DIAGRAM OF CONNECTIONS TO ALTERNATING RECEIVER.

In operation, the condensation rises in the receiver with an increase of boiler pressure until the float opens a valve. This is located in a steam line connected direct from the boiler and when automatically opened admits steam so that the pressures in the boiler and receiver are equalized. The water then flows back by gravity without collecting in the return mains or risers.

The main return should be not less than 4 ft. above the water level of the boiler while the water-line of the receiver, as shown by gauge, should be not less than one-half this height. On installations of the type shown (modulating), the return side of the system is arranged so as to open to the atmosphere through a vent connected to the chimney.

Power Requirements for Ventilation.

If you are thinking of increasing or decreasing the volume of air used for ventilation, drying, or for other purposes, the accompanying chart will be found handy for determining the future amount of power necessary to force the air through.

It is well known that the power required to force air through a given passage varies approximately as the cube of the volume. This chart, therefore, is based upon that commonly-used rule.

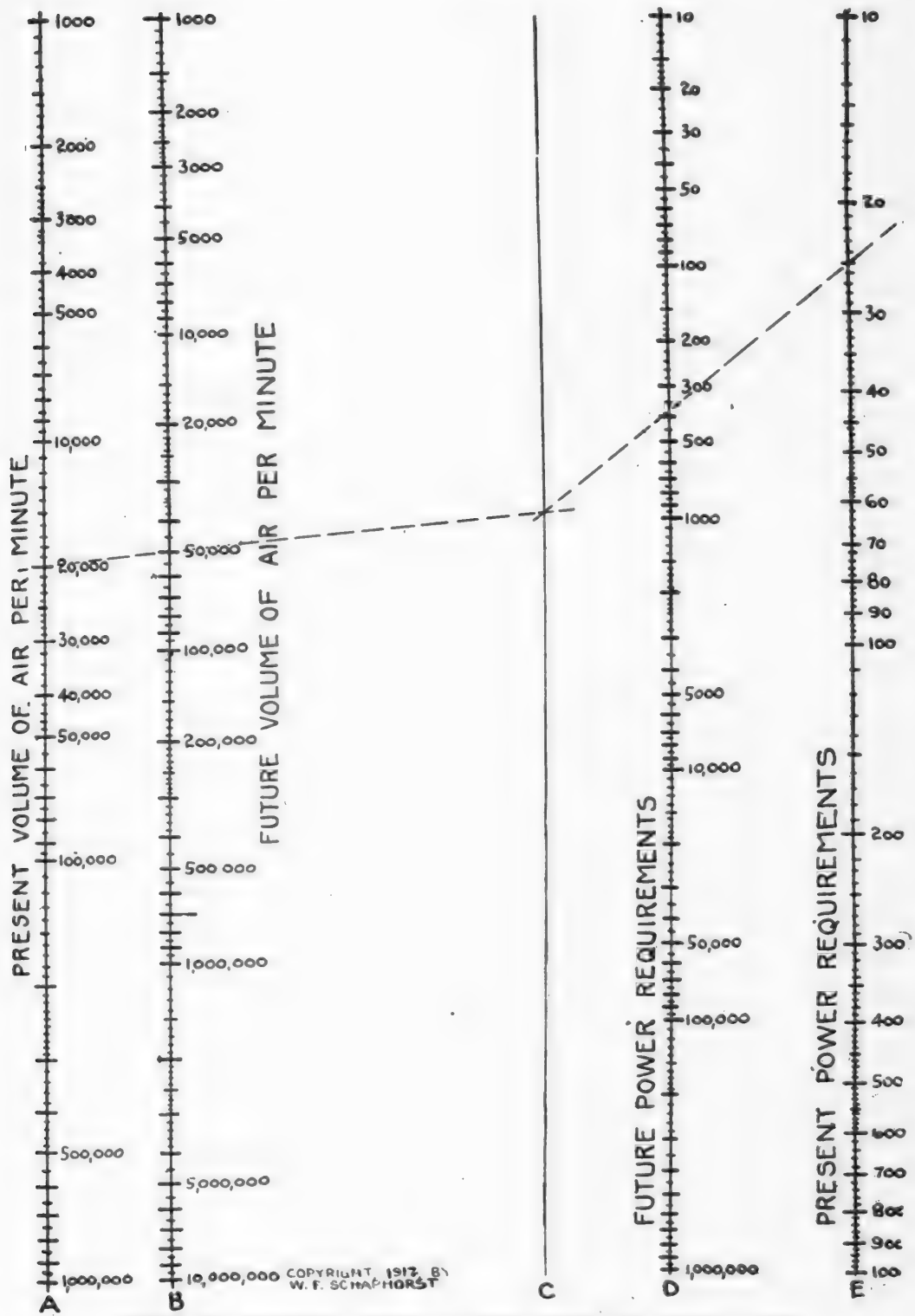


CHART FOR FIGURING POWER REQUIREMENTS FOR VENTILATION.

For example, if at present you are ventilating with 20,000 cu. ft. of air per minute and you wish to increase the quantity to 50,000 cu. ft. per minute, what power will be required, if the present arrangment uses 25 H. P.?

Connect the 20,000 (Column A) with the 50,000 (Column B) and locate the intersection with Column C. Then from that point of intersection run over to the 25 (Column E) and the intersection with Column D gives the answer as 375 H. P. The dotted lines drawn across the chart show just how it is done. It is only necessary to lay a straight-edge across the chart twice and Column D gives the answer.

In case the volume of air is to be reduced one would simply use the chart "backwards." If the horse-power or volume, as given by the chart, are too high, a cipher or two can be taken off for figuring purposes. The same dotted lines, for example, could show that where a volume of 200 is to be increased to 500, and where the present power is 0.25 H. P., the future power will be 3.75 H. P. The range of the chart, therefore, is great enough for any condition or quantity.—*W. F. Schaphorst.*

Cost of Piping in Relation to the Power and Heating Plant.

In estimating the cost of piping in relation to the combined power and heating plant, it is often the custom to affix this as a percentage of the whole. Such a practice will give costs of wide variations and is a method far from accurate.

The nature of the service for the plant should be known. For instance, if the plant is used exclusively for heating, the steam might be piped directly from the boilers. This would eliminate considerable machinery, such as engines, generators, switchboards, etc., that would be included in the electrical plant; thereby making the piping a larger proportion of the cost of machinery for the heating plant. An air-compressor plant would have a different ratio of costs than that of an electric plant. Furthermore, where the exhaust steam from an electric generating plant is piped out for heating buildings, the proportion of piping is much larger than for an ordinary plant.

It would seem a better practice to rate the capacity of a plant for cost purposes by the boiler horse power rather than by the K. W. of the generators. For instance, as with two engine generator sets of 1200 K. W. and two air compressors each of about 360 H. P., the boiler capacity would be about 2000 H. P.

In general, figures as to the cost of piping in a plant should be accompanied by a statement as to whether the plant is condensing or non-condensing, as there is a very much larger percentage of piping in a condensing plant.

The cost of piping should note whether or not the cost of the steam auxiliaries is included, such as feed-water heaters, boiler feed pumps, tanks, etc. It is the usual practice in letting piping contracts to include more or less of these steam auxiliaries, and unless the contract prices for several plants are reduced to a common basis, either including or omitting the steam auxiliaries, the figures would not be of service.

A general description of the nature of the piping should accompany the statement of cost since it is easy to run the cost of pipe of any particular plant up to 25% or 50% by specifying different classes of work. For instance, galvanized-iron pipe, wrought-iron pipe, piping with Van Stone joints, special fittings for superheated steam, various grades of pipe coverings, canvased and painted, and removable coverings for pipe fittings, would make a material increase in the cost as compared with that for ordinary piping.

Current Heating and Ventilating Literature.

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the article mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

ANTHRACITE BURNING. Burning steam Sizes of Anthracite With or Without Admixture of Soft Coal. Bur. of Mines, technical paper No. 220, reprint of eng. bul. No. 5, prepared by U. S. Fuel Administration 1919, 8 pp., 1 fig. Emphasizes that greatest loss in burning fine anthracite is on account of excess air of fire and advises that best way to keep this down to proper minimum is by using uptake damper, throttled as much as possible so as to produce highest CO_2 with formation of unburnt gases. 30c.

COAL COMBUSTION. The Economic Use of Coal for Steam-Raising and House Heating, John Blizard. Can. Dept. of Mines, bul. 28, no. 502, Jan. 30, 1919, 21 pp. General principles of combustion of coal and generation and uses of steam. 50c.

MODERN PRACTICE IN VAPOR HEATING

EDITOR'S NOTE: *For the purpose of this series of articles, a vapor, vacuum, vapor-vacuum, vacuum-vapor, atmospheric, modulated or thermograde system of heating will be considered as any system in which the steam pressure ordinarily carried is practically at atmosphere or slightly below or in which the returns are open to the atmosphere and where no pump or other positive mechanical device is employed to pull back the returns.*

XV—THE DONNELLY SYSTEM

The Donnelly positive "air return" system of vapor heating has, as perhaps its most characteristic feature, impulse check valves which are attached to the return end of each radiator. The use of this type of valve allows the water of condensation, together with some of the steam, to pass from the radiators into the return pipe. The seat of the impulse valve is made much smaller than that of an ordinary

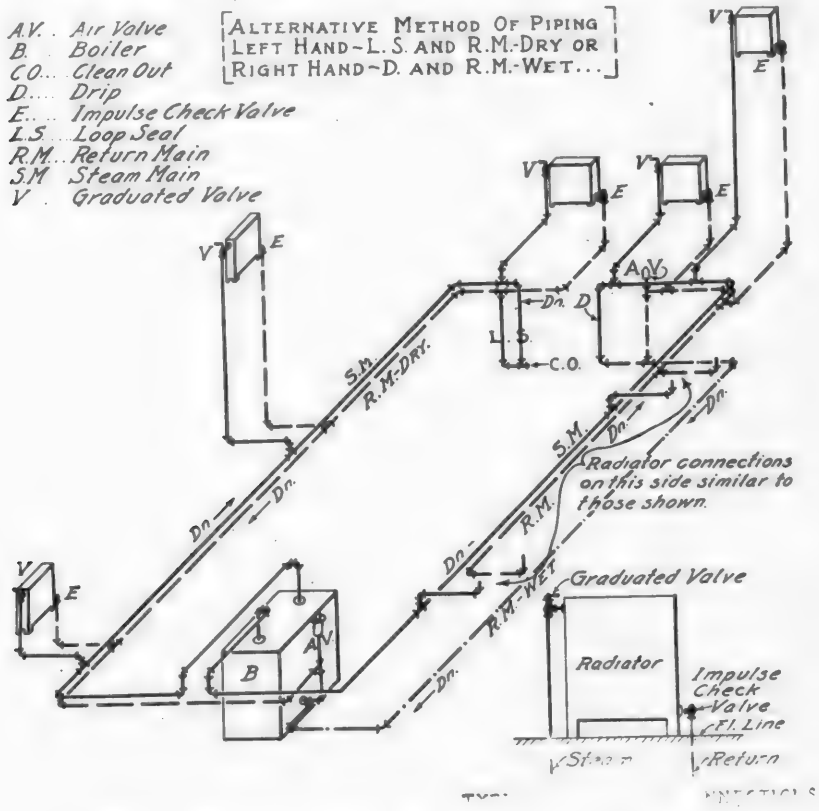


FIG. 1—TYPICAL LAYOUT OF DONNELLY SYSTEM.

check valve, so that it may properly control the flow of water and steam from the radiator. The weight of the disc over the area of seat, as well as the restriction are proportioned so that the pressure in the return lines is from 1/4 to 1/2 lb. lower than the pressure in the steam main, irrespective of the pressure carried. When the supply valve of the radiator is closed, the impulse check valve prevents any water or steam entering the radiator from the return.

Air is expelled from the system through a thermo-float air valve placed at the end of the return main before it drops to the boiler. This valve is constructed to close against either water or steam. It has a combined expansion and float piece to take care of the discharge of the air and the closing of the outlet, upon the completion of the air removal. An adjusting screw is provided so that the valve may be easily regulated. The interior is accessible for cleaning by removing the cap of the valve.

A check valve may be placed upon the outlet, if desired, to prevent the return of

air and to allow a partial vacuum to be carried. It is recommended that this be done on the air valve for groups of radiators farthest from the boiler, or those located on the cold side of the building.

The ordinary type of steam radiator is recommended for use with this system, with the inlet at the top and the outlet at the bottom, on the opposite end. The water type of radiator may be used, if desired, the only advantage being that the outlet may be at the bottom, at the same end as the steam inlet. With the steam type of radiator the partial heating of the radiator, when under fractional control of the inlet valve, is horizontally from the steam end toward the return end, while with the water type it is vertically from the top toward the bottom. A complete removal of the air and water it is stated, may be obtained in either case.

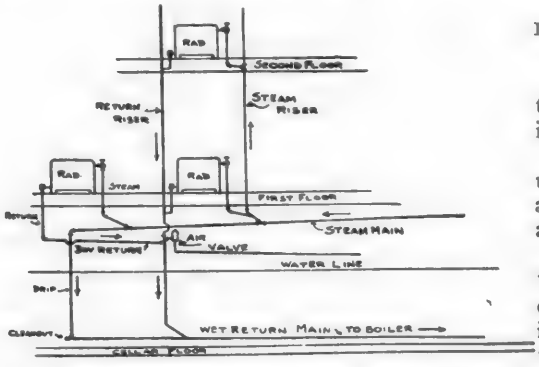
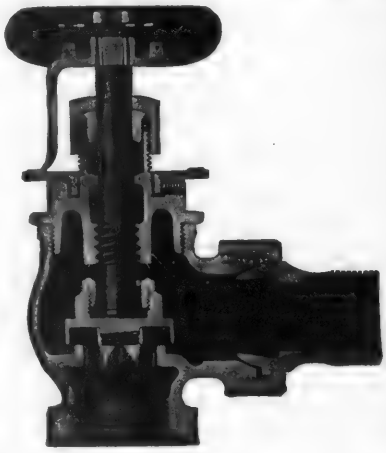


FIG. 2—METHOD OF DIVIDING RADIATION INTO GROUPS IN LARGER SYSTEMS.

Each radiator or coil must be provided with a fractional valve on the supply end, as well as the impulse valve on the return end. Both steam and return main, of course, should be graded in the direction of the flow in them. The steam main, also, should be dripped wherever necessary, either to a wet return or through an impulse valve or a loop seal. The latter is made of 1-in. pipe, at least 4 ft. deep, with a clean-out opening closed by a nipple and cap at the bottom. As the return pipes are used for carrying the air as well as the water, they must not be trapped and the minimum height of the horizontal dry return ,above the water-line of the boiler, must not be less than 20 in. in a plant where the total length of run of the steam main is 80 ft. or less. When the run is over 80 ft., the height must be increased 2 in. for every additional 10 ft. of run. Where the plant is of moderate size (80 ft. run of steam main) all the air may be removed from the return mains at the boiler, as shown in Fig. 1. A tee should be placed in the return where it drops to the boiler, and an air chamber provided at least 6 in. high, of the full size of

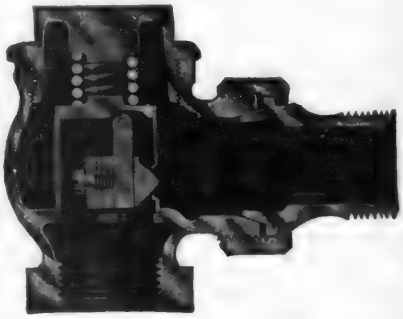


FRACTIONAL RADIATOR VALVE USED WITH DONNELLY SYSTEM.

the opening. The air valve should then be inserted in a reducing coupling.

An ordinary damper regulator may be used for controlling the steam pressure, and no other special appliance is necessary at the boiler.

One of the advantages mentioned for this system is that when severe weather demands a higher pressure, the automatic impulse valves will pass enough steam into the return lines to close the air valve, and maintain a sufficient pressure to automatically return the water of condensation to the boiler. Thus the system changes in



IMPULSE VALVE USED AT RETURN END OF RADIATOR.

operation from one with an open vent to a sealed system without the necessity of any adjustment or attention.

Where the plant is of a larger size, the return piping is divided into groups, as shown in Fig. 2. An air valve is placed at least 20 in. above the water line, and a wet

return is carried back to the boiler, or to the trap and cooling coil in central heating systems. As the radiation may be heated to its maximum efficiency, and as pressure may be carried in severe weather, the amount of radiation used should be the same as in the ordinary pressure steam heating system.

THERMO-FLOAT AIR VALVE.

The devices used in this system are made under the Donnelly patents by the Donnelly Systems Company, New York, and emphasis is laid on the fact that no royalty charges are made for the use of the patents covering the valves, or for their application to heating systems, where these devices are used exclusively.

LEGAL DECISIONS

City's Power to Increase Heating Rates.

The Iowa statute, Code Supp. 1913, Sec. 725, provides that a city's power to fix charges for water, gas, heat, etc., shall not be abridged by ordinance, resolution, or contract, and section 776 provides that franchise shall not be granted, renewed, or extended for the use of the streets, etc., unless a majority of the legal electors vote in favor thereof. The Iowa Supreme Court holds, Iowa Ry. & Light Co. v. Jones Auto. Co., 164 N. W., 780, that under these provisions the rates specified in a franchise granted by a city to construct and operate a heating plant system for supplying heat to the city and its citizens were subject to subsequent adjustments, as might be deemed expedient or necessary by the city council, though the franchise was granted with the approval of the electors. Under these sections and Code, Sec. 1619, providing that articles of incorporation, etc., of corporations shall be subject to legislative control, and may be regulated, withheld, or subjected to conditions, where a city council changed the rates specified in a franchise to construct and maintain a heating plant there was no impairment of the obligation of the so-called contract. Under section 725 the power to fix rates is a continuing power, and rates may be fixed permanently, or for any specified time by ordinance or resolution or authority to regulate and fix rates charged by a company granted a franchise to construct and maintain a heating plant system for supplying heat was held not limited to reducing the rates specified in the franchise, but included the power to increase them, and it was not essential that the change of rates should rest on a new consideration. An increase of such rates was not invalid, though at the time Code Sec. 720 contained no provision for the amendment of the franchise, as in view of the supplementary section 725, which must be read into the franchise, this did not amend the franchise, but simply carried out its terms, and it was immaterial that the fixing of the rate was accomplished by an ordinance amending the section of the franchise specifying the rates to be charged.

By-Product Service—Apportionment of Expenses.

In a valuation for rate making the Colorado Public Utilities Commission held Lamar v. Intermountain Railway, Light & Power Co., that, as exhaust steam is in every sense a by-product of the electric plant, the revenue derived from the sale of steam heat may properly be considered as a nonoperating revenue of the electric property, and that the operating expenses directly assignable to the steam-heating property may properly be considered as nonoperating expenses assignable to the electric property. No attempt whatever was therefore made to apportion such expenses as labor, fuel, commercial expense, general expense, and taxes between the steam-heating and electric departments. While such treatment of a utility supplying both electric and steam-heating service appeared to the commission to be fair to all parties interested, it might not be proper if a utility placed its rates for steam-heating service at so low a point that the revenues therefrom would not meet the fixed charges on the investment in the steam-heating property. It was held that the value.

rather than the cost of service, must govern in the matter of establishing rates for steam-heating service.

Heating Utility Cannot Discriminate in its Service.

The Wisconsin Railroad Commission holds that a heating utility is under obligation to serve without discrimination all applicants for service who can be provided with heat satisfactorily from its heating plant. Further extensions of service should also be made if the prospective business is sufficient to secure a reasonable return on the additional plant investment which is necessary for providing adequate service to the additional consumers.

The same Commission holds that 85 lbs. per square foot of radiation connected per annum, when used with average efficiency, constitutes a liberal allowance for the operation of a steam heating plant belonging to a municipal utility.

Apportionment of Costs of Operation.

The Wisconsin Railroad Commission holds, The Milwaukee Electric R. & Light Co., that the total difference between the cost of operation of noncondensing equipment for the production of electricity and the cost of operating the highest type of condensing equipment, should not be charged to the steam heating plant of a utility supplied by exhaust steam from the electric power plant.

In determining the reasonableness of the rates of a heating utility operated in connection with an electric plant, the same commission considered the heating department as an auxiliary, installed for the purpose of utilizing heat that would otherwise be wasted, and charged it only with the difference in cost of the operation of the combined plant and cost of operating the electric plant only.

THE RECONSTRUCTION ERA

Legislation Needed to Make Funds Available for Construction.

Commenting on these and other measures for making funds available for construction, F. T. Miller, president of the F. W. Dodge Company, states, in a circular on the subject:

"It is the belief of the proponents of these measures that the taxation yielded by the permanent wealth created through the use of such loans (real estate mortgages not exceeding $40,000) will more than offset the amount of the income tax exempted and that through such investments the general productive capacity of the nation will be increased. The proponents of these bills hold that inasmuch as a national shortage of building construction and of money available for it has been brought about through government measures, the remedy should come through the same channel. They also hold that the measures proposed will bring immediate results throughout the nation without the creation of administrative machinery."

Regarding the proposal to license building and loan associations to rediscount through bond issues, in order that they may make loans to intending home-owners, he states that "these bills aim to extend to the home-owner aid similar to that which the Farm Loan Bill already furnishes to the farmer; but unlike the Farm Loan Bill, these bills do not extend government financial aid, as the building and loan associations already have ample assets. The problem of the building and loan associations is simply to make their assets more liquid."

Continued Demand for Stenographers and Typists for Government Service.

Under date of August 1, 1919, the U. S. Civil Sevice Commission has issued a bulletin stating that notwithstanding the fact that the government now employs about 20,000 stenographers and typists in Washington, the commission has calls for eligibles to fill several hundred permanent positions in excess of the number of eligibles available. There will always be a demand, the commission states, for stenographers

and typists in Washington, for fully 200 eligibles a month are needed to fill vacancies which normally occur in so large a force. The Civil Service Commission holds examinations for stenographers and typists in 500 cities throughout the country every Tuesday. Most departments pay entrance salaries of $1,200 a year for stenographers and $1,100 a year for sypists, in addition to bonuses which have been authorized by Congress, amounting as a rule to $20.00 a month. Full information regarding examinations, etc., may be obtained from the secretary of the local board of civil service examiners at the post-office or custom-house in any of 3,000 cities, or by writing the Civil Service Commission in Washington.

Analysis of the High Cost of Living Problem.

The United States Council of National Defense has prepared an analysis of the high cost of living problem through a survey conducted by its Reconstruction Research Division. The findings of th council indicate that the high cost of living is due primarily to curtailment in the production of nearly all commodities except raw food products, to hoarding of storage food products, to profiteering, conscious or unconscious; and to inflation of circulating credit. It is held that the situation may be most advantageously met by stimulated production, the repression of hoarding and profiteering, the improvement and standardization of methods and facilities for distributing and marketing goods and the *perfecting of means for keeping the nation informed regarding probable national requirements and current production and stocks.* The findings particularly emphasize the fact that high standards of living cannot be maintained upon any basis of reduced production.

The National Budget System.

The proposal to establish a national budget system, which is now before the House of Representatives, has received the endorsement of the United States Chamber of Commerce. It is pointed out that the immense burden placed upon the people and upon business and industry in general, as the result of government expenditures during and since the war, has led to the greatly increased interest in the manner in which the government expends its funds and a demand for stricter and more intelligent methods of appropriating and accounting. A national budget, it is held, will introduce standards of business in correlating income and outgo and afford information as to the disposition and sources of public funds.

Co-Operation and Industrial Progress.

In a thoughtful address before the National Safety Council on the subject of employees' representation in the management of the industries with which they are connected, Cyrus McCormick, Jr., works manager of the International Harvester Co., of Chicago, declared that the fundamental point in our industrial trend to-day is the representative direction of industry. All else is really detail. Profit sharing may come when it is ripe for it to do so. Governmental action or re-arrangement of our program of consumption may make it possible for employee to be free from fear of unemployment. Education may raise the standard of working conditions to a real art. But if workmen are allowed self-government, they and their employers together can work out these programs. If not, they will never enjoy them. If the step of accepting employee representation is now taken by the American industry as a whole, the future is secure. The working out of details can be safely left to the joint deliberations of that active intelligence which, common to both men and management, has placed American industry where it is.

In the course of his address Mr. McCormick discussed such theories as syndicalism which has made such rapid strides in eastern Europe and then presented at length what he considered the fundamental principles underlying employee representation. He also discussed the working of the plan as adopted by the International Harvester Company. He took pains to define such representation as having to do only with "those questions relating to working conditions, protection of health, safety, wages, hours of labor, recreation, education and similar matters of mutual interest to the employees and the management."

"The time may come," he added, "when employees will wish to share in the executive management of a business. This, however, will be a matter for generations of education and development; and at the present time no one, except the syndicalists, is demanding participation in the management except as it affects the interests of the men."

He also pointed out that such representation does not mean the "closed shop."

At the same time he believes that organized labor should welcome the employee representation plan as an ally, although the American Federation of Labor, at its convention in Atlantic City last June, adopted elaborate resolutions condemning the plan. Employee representation, Mr. McCormick stated, has not been set up in opposition to organized labor. It is not an endeavor to create company unions or to do anything to deprive the men of the results which long years of industrial history have secured for them.

Plan for Meeting the Nation's Housing Needs.

In a recent notable address by Senator Calder of New York in the Senate the speaker discussed at length the matter of providing housing facilities and declared that at the present time there is a shortage of 1,000,000 homes in this country. He recommended the creation of a home-loan banking system thereby making available, he estimated, at least $2,000,000,000 of existing assets for building purposes. He also proposed relieving from taxation the income on a limited amount of real estate mortgages in the hands of individuals, thereby encouraging investment in securities of this character, and, in the end, making sufficient funds available for building purposes.

The purpose of the home-loan bank bill, Senator Calder explained, is to make immediately available a part of the $2,000,000,000 of gold assets held by the building and loan associations of the United States by having the government license these associations to form into group organizations or local home-loan banks, with which they may deposit their mortgages and receive long-term loans upon them, the funds becoming available through the issuance by the district home-loan banks of salable bonds against mortgages deposited.

Proposed National Department of Public Works.

Since the Jones-Reaves bill was introduced in Congress, providing for a National Department of Public Works, an increasing amount of interest has been shown in its provisions. As has been stated, the proposed department, which is the suggestion of the Engineers', Architects' and Constructors' Conference on National Public Works, changes the name of the Department of the Interior to the Department of Public Works. It transfers the non-engineering activities of the Interior Department to other appropriate branches of the government and in turn transfers to the Department of Public Works:

1. The Supervising Architect's Office from the Treasury Department.
2. The Construction Division, U. S. Army, River and Harbor Improvements, Mississippi River Commission and California Debris Commission from the War Department.
3. Coast and Goedetic Survey and Bureau of Standards from the Department of Commerce.
4. Bureau of Public Roads and Forest Service from the Department of Agriculture.

America's Housing Needs.

It is announced from Albany, N. Y., that in the opinion of Allen Beals, in an address before the New York and New England Brick Manufacturers' Association, the United States needs 1,300,000 homes, 450,000 factories, 5,000 schools and institutions, 55,000 apartment houses, 20,000 theatres and churches, 120 freight terminals and 14,000 railroad stations and freight sheds.

Resolutions Adopted at "Our Country First" Conference.

Resolutions adopted by "Our Country First" Conference, held in Chicago, September 8 and 9, upheld the rights of private property as against the efforts of certain radical elements of society to spread the seeds of Bolshevism, of ultra-socialism and other like doctrines among the people. The continuation of the United States Employment Service was opposed on the ground that the government should refrain from engaging in any business which can be as well or better operated by private enterprise. The conference rejected the idea of government ownership of the railroads or their management under domination by employees and urged a law for the prompt re-establishment of private operation. Price fixing was characterized as "dangerous," the relations of employer and employee are treated at length, the conference going on record for making the labor unions legally responsible for their actions and those of their officers and agents. Under the heading of distributing the cost of the war," the conference favored such a distribution of taxes as would avert an intolerable burden on the present generation. As a step towards the stabilization of the American dollar, American business men are urged to encourage reciprocal

buying of foreign goods so far as is consistent with the welfare of American trade. Radical propaganda, especially among school children and college students, is condemned and the conference also went on record as opposed to Article 20 of the proposed League of Nations which establishes an International Bureau of Labor, on the ground that it is in the interest of a special class of citizens.

Progress in Establishing International Pipe Threads.

Further discussion of the project to establish an international standard for pipe threads was brought out at a meeting of the Committee on International Standard for Pipe threads, A. S. M. E., held in the Engineering Societies Building, October 2. The committee will now prepare resolutions to be presented at the next meeting of the Commission for an International Standard Pipe Thread, which will be held in Paris, November 7.

Standardization an Aid to World Peace.

At a dinner given in honor of Charles LeMaistre, secretary of the British Engineering Standards Association, by the American Engineering Standards Committee, September 18, the guest of the evening expressed the opinion that one of the strongest ties which can bind two or more nations together is engineering and industrial standardization.

Standardization, he said, means efficient production. It can only be effective, however, when over-lapping is avoided. Overlapping can only be obviated by the operation of some central organization. In Great Britain, he added, overlapping of effort is becoming less and less each year and the British Engineering Standards Association is becoming more and more recognized as the central authority for drawing up standards for the engineering and allied industries.

National Safety Council to Study Health Relations in the Industries.

The National Safety Council announces an affiliation with the University of Cincinnati for the purpose of carrying out a program which will include the establishment of an industrial medicine division at the University of Cincinnati where medical students and graduate physicians will be given special training, not only in industrial medicine, but in industrial relations, including sanitation and all the fundamentals of safety work as well. The enterprise was conceived and is being financed by the industrial leaders of Cincinnati and vicinity, who have guaranteed a fund of about $40,000 annually, for five years. The facilities of the school include an industrial research laboratory where physical conditions menacing the health of employees arising in industry will be investigated. This laboratory will make an extended study of the effect of dust on the human system and of gas fumes.

Dr. Carey P. McCord, who was active in organizing and conducting military hospitals during the war, has been appointed director of the Department of Industrial Medicine and Public Health of the University of Cincinnati. The National Safety Council will be represented at the school by C. H. McLain, formerly safety engineer and assistant to the supervisor of labor at the Dayton Electrical Company.

CORRESPONDENCE

Proportioning Heat Losses to Room Volumes.

EDITOR HEATING AND VENTILATING MAGAZINE:

A standard rule for computing radiation, as suggested in your June issue, is certainly a step in the right direction, but does not the proposed rule leave rather more than is necessary to judgment—or guesswork? Why should the leakage losses be proportioned to room volumes, to which they are only vaguely related, rather than to outside exposure, to which they have a definite relation? Of course, if you can guess just the right air change (between one-half a volume and three volumes) to allow for any particular room, you will come out all right, but that guess, to be more intelligent, must be based mainly on outside exposure. Therefore, why go at it in such a roundabout way?

Professor Hoffman, in his article published in your May issue, says: "Leakage losses are usually taken in terms of room volumes." This statement may be hard to refute, as "usually" is a vague term. Certainly, many practising engineers have for years preferred to compute such losses on the basis of exposed wall area.

I also note that the exposure factors given in the proposed rule are much lower than those in common use. N. S. Thompson,

chief engineer in the Supervising Architects office in Washington, uses the factors recommended, I believe, by Professor S. H. Woodbridge, of the Massachusetts Institute of Technology, 25 or 30 years ago, viz.: North, 35%; west, 25; and east, 15%.

Boston, Mass. P. N. K.

Effect of Humidity on Heat Required to Raise Air Temperatures.

EDITOR HEATING AND VENTILATING MAGAZINE:

Is more heat required to maintain a given room at 71° F., with a relative humidity of 30% than to maintain the same room at a temperature of 65° with a relative humidity of 65%, other conditions being the same in each case? If so, why?

As you will note, comfortable conditions are assumed in each case and the question really reduces itself to the question of what effect humidity of the inside air has on the number of B. T. U. required to heat 1 cu. ft. of air one degree.

La Crosse, Wis. H. L. C.

This problem reduces itself to the qauntity of heat required to raise 1 lb. of air from an assumed temperature, say, 25° F. and 50% relative humidity to 70° F. and 30% relative humidity; and from 25° and 50% relative humidity to 65° and 65% relative humidity. The same weight of air will be used in each case and the following quantities will be required.

Case 1. 25° and 50% to 65° and 65% for 1 lb. weight.

Total heat of steam at 25° is about 1069 B. T. U. per pound.

Total heat of steam at 65° is about 1088 B. T. U. per pound.

The air is raised 40° and the specific heat is 0.24.

From the Carrier psychrometric chart there are in air at 25° and 50% relative humidity, 10 grains of moisture per pound. At 65° and 65% relative humidity there are 60 grains per pound. The B. T. U. for the dry air is for 1 lb., or 7,000 grains:

Dry air 40 x 0.24.....	0.6	B. T. U.
Raising 10 gr. moisture 25° to 65° = (10 ÷ 7,000) x (1,088—1,069)	0.027	B. T. U.
Evaporating [(6—10 gr.) ÷ 7,000] x 1088+7)=.....	7.82	B. T. U.
Total	17.447	B. T. U.

Case 2. The B. T. U. for the other case (25° and 50% to 70° and 30%) for 1 lb. air works out as follows.

Air at 70° and 30% relative humidity, according to the same chart, has 32 grains moisture per pound, or an increase of 22 grains per pound. Total heat of steam at 70° = 1,090.3 above 32°.

Dry air (70—25) x 0.24=...10.8		B. T. U.
Initial moisture (10 ÷ 7,000) x (1,097.3—1,069).....	0.0404	B. T. U.
Evaporating (22 gr. ÷ 7,000) x 1,097.3=.....	3.45	B. T. U.
Total	14.2904	B. T. U.

In one case, for 1 lb. of air, 17.5 B. T. U. are required and, in the other 14.3 B. T. U. 17.5 ÷ 14.3 = 122% of the minimum quantity.

Checking this with the same chart, we have:

Wet-bulb temperature for 25° and 55% relative humidity, 23° F.

Wet-bulb temperature for 65° and 65% relative humidity, 58° F.

Wet-bulb temperature for 70° and 30% relative humidity, 53° F.

Extending these up on the curve of total heat, and reading the B. T. U. above zero, we have:

25 and 50%, wet-bulb 23° =	7.5	B. T. U.
65° and 65%, wet-bulb 58° =	25	B. T. U.
70° and 30%, wet-bulb 53° =	22	B. T. U.

This checks the computation, as near as the chart can be read.

Wages Paid Out-of-Town Workmen.

EDITOR HEATING AND VENTILATING MAGAZINE:

Is it your understanding that a contract taken at the prevailing rate of wages is to be finished at that rate, even though there may be an advance during construction?

Also, in sending men out of town on work, is it customary to pay the rate of the town plus board, or the rate of the town the work is being done in, plus board?

Albany, N. Y. C. S. R.

It is customary that a contract taken at the prevailing rate of wages is to be finished at that rate, irrespective of any advance during construction.

In sending men out of town on work, the rule is that they get the high rate. If the town you send them to has a higher rate, they get that rate. If not, they get the rate of the town you send them from—in each case, plus board.

The Trade Extension Bureau

Headquarters: Evansville, Ind.

The Principles of Fixed Charge or Operating Cost.

Under the heading of "The Principles of Fixed Charge or Operating Cost," the first business bulletin has been issued by the National Trade Extension Bureau. The bulletin is described as the first step in business efficiency for the heating and plumbing contractor. It contains an operating cost sheet covering no less than 48 items and computed for various total volumes of business per year, ranging from $5,000 to $150,000. The figures were obtained from 762 successful heating and plumbing shops. Some of the principal items, for instance, for a business of $50,000 per year are: Capital invested, $5,000; borrowed capital, $3,000; interest on capital $300.00; interest on borrowed money, $150.00; taxes (at $3.00 per $100.00), $144.00; rent (about 2%), $900.00. The salaries, including those of the owner, should represent about 10% of the gross business. Workmen's compensation insurance is figured at $75.00, business insurance at $250.00, depreciation at $500.00, advertising at $300.00, traveling expense at $200.00. An allowance of $250.00 is made for bad accounts. The total of fixed charge or operating cost is given as $9,679. The percentage of overhead (to be added to "Cost of Labor and Material") is 27 1/10%. In the matter of discounts it is figured that the discount that can be given from 100% list to make 10% profit is 30 1/10% of the volume of business stated. To make 10% profit, if 5% is allowed for cash, the discount from 100% is 26 2/5 plus 5%. A business operated on this basis would yield a net cash profit for the year of $4,545.81, and the percentage of overhead, based on sale price, would be 19 3/10%.

The various items comprising the cost sheet are explained in detail in the bulletin. In connection with the use of trade papers, it is stated that "no plumbing and heating contractor can read too many trade papers. They are the medium for the exchange of idea. They are a liberal education in business advancement. But trade papers do not end there. The really successful plumbing and heating contractors will read trade papers of other lines in order to secure the ideas others use in 'putting their business across.' Trade papers are a source of information that aids you in giving service. They bring you new thoughts that would take a lifetime to think out for and by yourself."

In explaining the percentage of overhead which, the bureau recommends, should be added to the cost of labor and material, an example is given on a gross business of $10,000 where the fixed operating costs were $2,350 and the net profits $900.00 for the year.

A simple plan is proposed which, it is added, is that employed by a majority of successful business men of this industry. As worked out the analysis shows that on a volume of business of $10,000 per year, 9 cents of every dollar sales is profit; 23 1/2 cents is the amount you get back to pay your operating cost and 67 1/2 cents represents the amount you pay out for labor and material.

Bulletin on Short Cuts in Estimating.

An important service bulletin on "Short Cuts in Estimating" is being prepared by the Trade Extension Bureau and is being compiled from information obtained from questionnaires on the subject. Most of the matter will refer to plumbing work, but there will be items on pipe covering and on vacuum cleaner work.

Call for Conference on Export Trade.

The American Manufacturers' Export Association announces the calling of a convention in New York, October 16-17, to determine and unite upon a definite plan of action with regard to trade with other countries. While the foreign trade of the United States reached the unprecedented total of over $7,000,000,000 for the year ending June 30, the figures for July showed a falling off of nearly $350,000,000, and this fact, coupled with the uncertainty of social and political conditions in Europe, and the serious and continuing depreciation of foreign exchange, has increased the demand of manufacturers and exporters for information as to the best means of meeting the unusual situation in which business now finds itself. Particu-

lar attention will be given in the forthcoming convention to the question of trade with the new nations set up by the pending Peace Treaty and with Russia and the Central Powers.

International Trade Conference at Atlantic City.

An important International Trade Conference was held in Atlantic City, September 30-October 3, by invitation of the Chamber of Commerce of the United States, which was attended by delegations represented Great Britain, France, Italy and Belgium, as well as the United States.

Among the topics considered were economic readjustment of commercial and industrial conditions in England, France, Italy and Belgium. This will involve something like an inventory of available supplies and resources, with a view of arriving at an estimate as to the requirements of food, raw material and manufactured articles for, say, a two-year period, and should be of a character to serve as a guide to American business men, manufacturers, producers, and bankers, in planning their trade relations in the future.

Other subjects up for discussion were: Finance, international fair play, and food and the cost of living.

The foreign delegates, it is stated, made careful preparations for the conference and were fully equipped to give the American public the information needed. A further report of the conference will be given in next month's issue.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

New York Chapter Prepares for Active Season.

A clarion call, issued by President Perry West of the New York Chapter in anticipation of the opening of the chapter's Fall season, indicates the lines of activity that will be taken up, as well as the opportunities before the chapter.

"Never before in the history of time," declares President West, "have there existed such opportunities for general evolution and never before has the New York Chapter had so many man-sized, interest-compelling calls to service sounded in its ears."

Among the meetings planned is one to discuss "What the Research Bureau Should Do," so as to crystallize the thoughts of as many members as possible on this subject, for the use and guidance of the bureau committees. Another meeting will be devoted to an "Engineering Symposium," to discuss the work inaugurated last March by eighteen of the leading national engineering societies and designed to co-ordinate the efforts of all engineers toward making themselves better citizens, with a collective active part in the world's work. A committee of the chapter is at present working with the local branches of other societies on this matter.

A "Visitation Meeting" has been planned, the intention being to have the chapter visit in a body the newest and most interesting heating and ventilating development in the vicinity. Another meeting will take up "What the Engineer Gave and Received from the War."

The plans also include one "reception meeting" in honor of visitors from other chapters and the dean of the Research Bureau, and one "distinguished outside guest" meeting, with at least two speakers of national repute on economic, industrial and political development. The remaining two meetings of the season will be devoted to business and to the annual dinner of the chapter.

The Building Trades Club, at 30 West 33rd Street, New York, will continue to be the meeting place of the chapter, with a dinner preceding the business of each session.

Dedication of Bureau of Mines Laboratories in Pittsburgh.

Special interest was taken by the heating engineers in the dedication of the Bureau of Mines' new $1,000,000 laboratories in Pittsburgh which took place September 29-October 1. It is in this building that the Bureau of Research of the heating engineers' society is located.

In connection with the dedication, the Bureau of Mines issued a souvenir program, containing numerous views of the exterior and interior of this interesting structure.

Much of the credit for the establishment of the Bureau of Mines, Pittsburgh plant is given to the late Joseph A. Holmes who, from 1891 to 1901, was professor of geology in the University of North Carolina, later State Geologist of North Carolina, and then chosen to organize the Department of Mines and Metallurgy at the Louisiana Purchase Exposition in St. Louis. Here was begun the work of analyzing and testing the coal resources of the United States and structural materials in connection with the exhibition. After the close of the exposition the work was continued under his charge.

The testing plant was subsequently transferred to the Jamestown Exposition and

PITTSBURGH EXPERIMENT STATION, BUREAU OF MINES. ERECTED AT A COST OF $1,000,000 AND DEDICATED SEPTEMBER 29-OCTOBER 1.

finally to the Arsenal grounds in Pittsburgh. In 1907 the Technologic Branch of the U. S. Geological Survey was organized, with Dr. Holmes in charge.

"Though the work of the bureau," continues the account, "was at first housed in temporary and unsuitable quarters, Dr. Holmes had a vision of a great experimental station for mining, where all kinds of accidents could be studied, and methods developed for their prevention."

The Fuel Section of the Pittsburgh station is older than the bureau itself, having its origin in the Government Fuel Testing Plant at the Louisiana Purchase Exposition in 1903. This work was finally merged with the bureau in 1910 and continued at the Arsenal Grounds in Pittsburgh until 1917, when the station was moved to the new building.

Fuel research work is done partly in the field, in co-operation with the U. S. Shipping Board and private companies interested in the most economic uses of fuels, and partly in the fuels laboratory, which is in the east wing of the power-plant building. The work of the Research Bureau of the American Society of Heating and Ventilating Engineers is carried on partly in the fuels lab-

REAR VIEW OF PITTSBURGH EXPERIMENT STATION, BUREAU OF MINES, SHOWING POWER PLANT BUILDING, WHERE TESTS ON HEATING BOILERS ARE BEING CONDUCTED.

oratory and partly in the mechanical laboratory on the ground floor of the west wing of the main building.

The field work of the fuels section consists of the following investigations:

Steam Boilers: A comprehensive study of the performances of various types of marine steam boilers.

Study of the Use of Powdered Coal: An investigation of what actually happens in the combustion space of powdered-coal-burning furnace, carried on in co-operation with commercial plants having large-sized apparatus. The two main problems in firing powdered coal under stationary boilers, it is stated, are ash disposal and furnace maintenance. The melted ash acts on the fire brick, reducing them to slag and requiring frequent replacement.

Use of Fuels in Distilling oils.

Tests of Coke as Fuel for Heating Houses: These tests are made in various types of house-heating apparatus, such as steam boilers of various makes, hot-air furnaces, stoves and open grates, to determine and demonstate the value of coke as a clean and smokeless domestic fuel. Tests are made with by-product coke, gas-house coke, anthracite coal and various kinds of soft coal. Visitors are invited to inspect the power-house and learn how to burn by-product coke in their house-heating plants this winter.

Combustion of Coal in Underfed Type of Stoker.

Heat Transmission Investigation, from hot furnace gases to the water in the boiler.

Other activities of the bureau are in the hands of the coal mining section, electrical section, mechanical section, chemical section, coal and miscellaneous analytical laboratory, gas laboratory, gas-mask laboratory, natural gas research unit, by-product coking research unit, microscopic research unit, petroleum laboratory, explosive chemicals laboratory, metallurgical and metallographic laboratories, physical laboratory, and an explosive section.

In addition, the bureau is carrying on a number of co-operative investigations with State agencies and mining schools.

At the dedication exercises a pageant was given representing the long history of men for the secret riches of the earth. Its theme was the gradual growth, through the ages, of science as the director of the search. The performance was arranged in a prologue, four episodes and an epilogue. The prologue treated in symbolic form of the hiding of all riches of the earth by the Earth Spirit, and in particular of the concealment of her children, the metals which formed bronze, gold, iron and coal, lest these four, being found, should become the slaves of man.

The four episodes showed, in four different periods, the conquest of these four earth-children. The first takes place at the beginning of the bronze age; the second, gold, in an ancient oriental setting; the third, iron, indicating the beginning of the modern industrial world; and the last and most important, coal, whose conquest implies the secret of power. The epilogue was a "Triumph of Science."

New Publications.

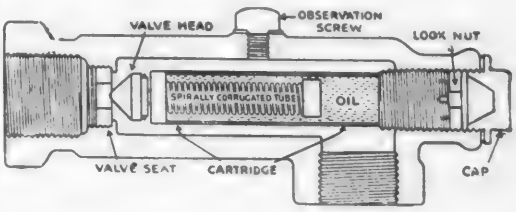
COLLOIDAL FUELS, their relation to coal, to the production of power and heat and to fire prevention and insurance. by Lindon W. Bates, is the title of an exhaustive discussion of the value of liquid and solid fuels, the author taking the position that fluid fuel has such superior merit that there cannot be too much of it when rightly distributed. Through colloidal fuel, the quantity of liquid fuel available may be doubled at the present rate of production of fuel oil. However much oil may pour to market from Mexico, it can all be absorbed. To get the carbon one may levy upon the unmarketable "breakage" inevitable to handling coal, upon coke braise and pea coke, upon the "seam dirt" of earth-crushed anthracite too fine to fire, but good for the composites. This, Mr. Bates claims, is the easiest way to avert a fuel famine, to promote true conservation and to attain scientific economy. Mr. Bates comments on the predictions as to the impending soft coal famine and declares that the most avoidable waste of coal is in the burning of solid fuels, while the most practical conservation is in converting solid into liquid fuel. He speaks especially of the great fleet that is being launched so fast and says that most of these vessels will burn liquid fuel. The manual takes up in succession, fuel and boiler efficiency, stationary power plant experience, and ratios of comparative efficiency of heat units of fluid vs. solid fuels. In figuring out these ratios the conclusion is reached that 1,000,000 B. T. U. in fluid will on an average equal 1,610,000 in hand-fired and 1,327,000 in mechanically-fired solid fuel. The discussion is accompanied by charts, including several showing the B. T. U. contents when various percentages of solid fuels are incorporated. Under "Properties of Colloidal Fuels," it is stated: (1) They are liquid and handle and atomize for combustion like fuel oil; (2) they contain more heat units per gallon than fuel oils; (3) they contain little moisture, are low in percentage of ash and sulphur; (4) they are vaporless and thus create no explosive mixture with air; (5) their flash

point is above 200° F.; (6) they will weigh from 8 3/4 to 11 1/2 lbs. per gallon, according to the kind and percentage of coal, pitch or coke employed; (7) they will sink and are thus self-quenching; (8) they may be "fire-proofed" by a water-seal of an inch or more of water which remains on top; (9) they are quenchable by water, where its surface may be covered; (10) when made with residual oils they take higher than 300° F. to start vaporizing; (11) they are the most compact fuels known; (12) in the buildings of New York, Colloidal would occupy two-thirds the space for equal heat units; (13) their fire-risk is as low as anthracite coal; (14) being non-volatile, their burning gives off no objectionable odors; (15) there need be none of the roaring noises made by the older types of burners; (16) safety features will exempt Colloidal fuels from the restrictions put upon ordinary fuel oil for storage, use and transport.

BUILDING AND INDUSTRIAL CONSTRUCTION is the title of an impressive brochure issued by the Thompson-Starrett Co., New York, containing illustrated descriptions of some of the notable buildings erected by this firm, as well as an idea of some of its extensive war construction operations. The preface outlines the company's policy of reducing to a minimum its dependency upon sub-contractors by combining and controlling all the processes which produce the finished structure. The company, it is stated has executed a total of over 400 contracts, involving a grand total of over $300,000,000. 52 of the contracts were in excess of $1,000,000 while one contract totaled $65,000.000 In addition to the prominent New York buildings shown, which were constructed by this company, the booklet shows also a number of power houses and industrial plants, together with great plant at Nitro, West Virginia, and at vivid "before and after" pictures of the Camp Upton.

Trade Literature.

STEAM TRAP SARCO AND SARCO TEMPERATURE REGULATORS are brought to the attention of the trade in newly-issued circulars. Both of these devices are manufactured by the Sarco Co., Inc., New York. At the Chicago Exposition of Chemical Industries the company's exhibit included Sarco steam traps of the expansion type for both low and high pressure, while the temperature regulators shown were for the control of liquids at atmosphere within a range of 30° to 300° F. Among the novelties on exhibition was an electric thermostat in operation and the new Sarco radiator trap for vacuum and vapor heating systems. G. H. Burke, Chicago sales manager, and E. J. Ritchie, of the New York office, were in charge of the exhibit. The Sarco steam trap is described as differing from every other type in utilizing the pressure of a fluid (a heavy hydrocarbon oil) hermetically sealed within a tube. In construction



SECTIONAL VIEW OF SARCO STEAM TRAP.

the trap consists of a steam pipe body which can be screwed on anywhere in a steam main or pipe, occupying little space and taking the place, if desired, of an elbow or bend. In this body a Sarco cartridge is inserted, the fluid in which operates a corrugated, hermetically-sealed, tombac tube. A piston is attached to the lower end of the tube carrying the valve head. Special attention is directed by the manufacturers to the diaphragm. The spiral corrugations, it is stated, insure that when the tube is expanded or contracted, the movement is equal on every turn of the spiral. The valve head is a bronze metal ball, freely turning in a socket, insuring a perfect seat and offering a large wearing surface. This construction also permits the provision of a strainer of ample surface. In fact, it has a discharge area ten times that of the valve itself. The trap is designed to work on any degree of vacuum and on any steam pressure up to 20 lbs. per square inch. The same principle of operation of the Sarco steam trap is used in the Sarco temperature regulator. In that case the oil-filled tube inserted in a water tank acts as a thermostat, the heat of the surrounding liquid expanding the oil and thus operating the valve through a line of flexible tubing.

LITTLE DRAFT-MAN FURNACE REGULATOR, manufactured by the Sahlin Mfg. Co., Grand Rapids, Mich., is featured in new circular matter in which its adaptability is explained for any damper-regulated furnace,—air, water or steam. The regulator is clock-operated, and may be located at any point desired, as in the bedroom. It is connected by chains to the furnace dampers. In installing this regulator, it is

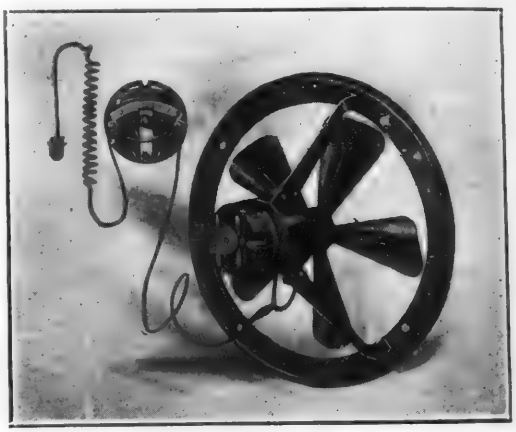
only necessary to screw the device to the wall directly above the heater chains and fasten the draft chains. The regulator is finished in bronze. It is listed at $15.00.

ALBERGER CENTRIFUGAL PUMPS AND ALBERGER-CURTIS STEAM TURBINES, are the subject of a new engineering catalogue (Catalogue F), received from the Alberger Pump & Condenser Co., New York. The descriptions and illustrations are presented in a way to make the data of the greatest usefulness to the engineer. The various types of centrifugal pumps and steam turbines manufactured by the company are fully covered. In addition, it is stated that to meet the demand for steam turbines best adapted for driving centrifugal pumps the company years ago secured from the General Electric Company the right to use the Curtis patents and the latest developments made by that company in its immense turbine output. The Alberger-Curtis steam turbine is described as embodying the latest and best theory and practice in steam turbine construction. Special attention has been paid to obtaining good steam economy at the relatively slow speeds required to obtain the most efficient results in centrifugal pump design. In making the steam turbine for centrifugal drive only the company has produced a symmetrical pumping unit when connected to the Alberger centrifugal pump. Valuable data in the form of power curves covering the characteristics of centrifugal pumps are included, with explanatory text. The catalogue then takes up the design and construction of the different types of Alberger centrifugal pumps, including the standard and regular volute pumps, vertical-shaft volute pumps, turbo-volute pumps, Type N multi-stage pumps, and turbine pumps. Several pages are devoted to the Alberger-Curtis steam turbines, the catalogue continuing with descriptions of Alberger boiler-feed pumps, mine pumps, pumps for floating dry docks, and pumps for graving docks. Diagrams are also presented showing the proper position of suction and discharge openings for the centrifugal pumps. All of the apparatus described is carefully illustrated, the concluding pages containing complete tables of dimensions. Size 6 x 9 in. Pp. 64.

BOWSER BATTERY STORAGE SYSTEM, for lubricating oil, is the subject of a circular received from S. F. Bowser & Co., Inc., Fort Wayne, Ind. A unique idea embodied in the circular is that it can be arranged to show one, two or three outfits, or a battery of four tanks. Attention is called to the fact that tanks of varying capacity may be placed in a battery and still be of uniform height. The illustration also shows how the oil barrels are emptied by gravity into the storage tanks. Hand pumps are attached to each tank, as well as oil gauges.

NORWICH STEAM AND WATER HEATING BOILERS, manufactured by the Young Boiler Co., Portland, Conn., are covered in a newly-issued catalogue, in which special attention is called to the company's new location where it is stated, in a new foundry, with new equipment, new organization and ample capacity, it is prepared to meet the demand for this well-known line. An interesting feature of this heater, which is of the round type, is the use of pins on the inside surface of the fire-pot to keep the fire broken at the outer edges and to prevent the water from chilling the fire. In the water type the sections are alternately "closed" and "open." This gives a zigzag circulation of the gases through the boiler.

BREEZO 16-IN ELECTRIC FAN is a new product of the Buffalo Forge Co., Buffalo, N. Y., which is illustrated and described in a special circular. While primarily a hot

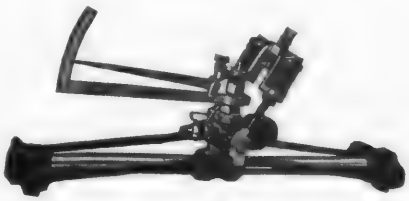


BREEZO FAN.

weather propositon, the fan will be found useful for ventilating purposes where a cheap unit, with adjustable speed, is required. The maximum speed of the fan is 1,000 R. P. M.; capacity, 1,000 cu. ft. a minute. It may be adjusted for six speeds and is made with noiseless ball bearings. The universal motor used will operate on any 110-volt circuit and, it is stated, takes about 1-30 H. P.

WINNER STEAM TRAP, described as unusually rugged and powerful in valve movement, is a new device brought out by the Winner Co., 30 Church St., New York, and

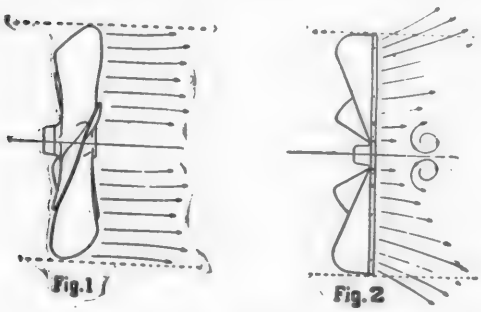
the subject of a newly-issued circular. It is described as being adaptable to all purposes and all apparatus requiring the removal of condensation, accomplishing such removal as fast as the condensation flows to the trap, whether in small amounts or large, up to its capacity, providing the inlet pressure is sufficiently great to overcome the outlet pressure or head that it may have to operate against. It is also characterized as one of the few that can be used outside in winter. Among its uses is as a



THE WINNER STEAM TRAP.

thermostat for regulating the temperature when steam is used for boiling and heating purposes. It is equally adaptable for high or low pressure steam and is carried in stock sizes from ½-in. to 2 in. pipe connections. Directions for installing the trap accompany the circular, one point being that the trap must be set in a horizontal position.

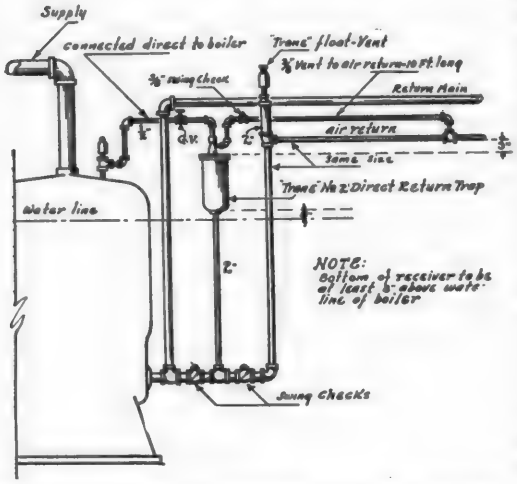
SCRUPLEX FANS AND EXHAUSTERS, a new type intended to operate at the maximum efficiency obtainable over widely-varying conditions from that of a free and unobstructed inlet and discharge to those imposing heavy resistance to the air flow, have been placed on the market by the L. J. Wing Mfg. Co., New York. They are the subject of a new catalogue issued by this company. The Scruplex delivers its air straight forward, in a column of practically the same diameter as the fan itself and at practically uniform velocity over its entire area. This fan is intended for general ventilation to supply fresh air, or exhaust vitiated air, when the air handled is not too heavily laden with grease, steam, acid vapors or is extremely highly heated. The Scruplex fan has been developed for high speeds, permitting the use of high-speed motors, which, in addition to being smaller in size, are electrically more efficient than motors operating at low speeds. The manufacturers make the point that high speed is also needed for high fan efficiency and refer to the recent testing of airplane propellers in which it was demonstrated that better efficiency is obtained at speeds ranging from 1,200 to 1,400 R. P. M. than at lower speeds. Quiet operation, it is stated, is obtained with the Scruplex fan by the design of the blades to cut and propel the air without shock at high speed. The Scruplex principle is also applied to the company's line of exhausters which are described as combining the advantages of the Scruplex fan with certain advantages which could only be obtained with the much larger equivalent or steel-is a unit of extremely small dimensions, plate type of fan. The result, it is stated, capable of exhausting large amounts of air. It is for use especially where the air is extremely hot or laden with grease, smoke, steam, vapors, gas, paint spray or anything of like nature which it would be unwise to attempt to handle with any fan of open construction in which the air or vapors handled must pass over the motor. Size 6½ x 9½ in. Pp. 16.



COMPARISON OF PRINCIPLE OF OPERATION OF SCRUPLEX FANS (FIG. 1) WITH OTHER TYPES (FIG. 2).

TRANE DIRECT RETURN TRAP, the mechanism of which is entirely inside the trap, is a new product of the Trane Co., La Crosse, Wis., which is featured in a recent catalogue. Engineers and heating contractors, it is stated, have long realized that vapor heating systems, or any system of heating, where the radiators are equipped with a thermostatic trap for gravity installations, require some positive means for forcing the return water back to the boiler during those periods when the difference in pressure between the boiler and the return pipe is such as to prevent the return of the condensation by gravity. The direct return trap, it is stated, solves the problem, as this device allows steam to enter the trap whenever the trap becomes filled with water, thereby equalizing the pressure and allowing the water to return to the boiler by gravity. The Trane direct-return trap is designed to meet the objections of complicated and expensive construction. It is now regularly made a part of the Trane system for installations re-

quiring over 400 sq. ft. of radiation. As will be noticed from the accompanying illustration of a typical piping connection, the vent pipe from the trap is carried directly into the return pipe of the heating system itself so that there is no loss of steam and no noise. The check valve, which is installed in this vent pipe, also



TYPICAL PIPING CONNECTIONS FOR TRANE DIRECT-RETURN TRAPS.

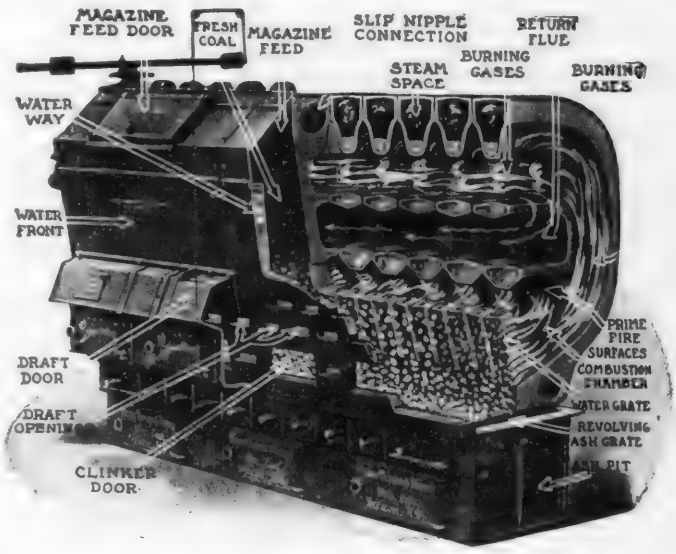
allows a vacuum to be created in the trap body which tends to lift the water rapidly from the returns and keeps them dry. This type of trap is also recommended for use on ordinary straight-steam plants where there is difficulty due to water leaving the boiler and accumulating in the return pipe. Where a considerable portion of the radiators are below the waterline, as in many factories, these traps will act to pump the water back to the boiler, regardless of its temperature. The catalogue, besides giving views of the construction of the trap, includes four typical layouts showing how the trap is hooked up with different types of heating systems. Size 6 x 9 in. Pp. 8.

ADVANCE RE-GROUND WATERPROOF PORTLAND CEMENT, described as a dense, integral water-proofing Portland Cement concrete, plaster, stucco, and mortar for all purposes, and Advance Hydro-Corundum Portland cement, a dense, waterproof, dustproof, wearproof and permanent Portland cement concrete floor and stair finished topping, is products of the Advance Waterproof Cement Co., 175 West Jackson Boulevard, Chicago, Ill., which are described in new circular matter published by the company. The process involves the regrinding of Portland cement to the fineness of talcum powder, thereby obtaining more collodial efficiency, waterproofing value, or cement glue than is produced by the standard specifications for fineness of Portland cement.

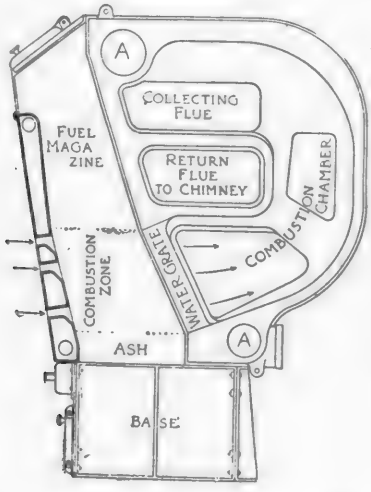
SIMCO STEAM BOILERS, WATER HEATERS AND GARBAGE BURNERS, described as the latest addition to the growing family of Sims heaters, has been placed on the market by the Sims Co., Erie, Pa., and is the subject of Bulletin S-No. 1. The heater is of water-tube construction and is designed for coal, gas or oil. Armco rust-resisting iron is used throughout, electrically welded. It is a double-shell water heater, having a 2-in. water space between the shells. 1½-in. Armco iron tubes are expanded into the inner shell tube sheets, and the tubes being so pitched as to insure rapid water travel and high heating efficiency, reducing to the minimum scale formation. Due to the material used in its construction these heaters are made up complete, ready for installation. They are described as in reality three units—a steam boiler, a steam tube storage heater and a coal-fired water heater. When the heating system requires steam the boiler serves the double purpose of furnishing steam for heating the building and heating water in the tank. When steam is not required the coal-fired water heater furnishes hot water stored in and circulated to and from the tank. The steam boiler and water heater may be operated as separate units, independent of each other, or together, as may be found necessary. Simco heaters are made in thirteen different sizes, with capacities ranging from 320 to 4,000 gal. per hour of heated water, the figures being based on a 100° F. rise.

SIMCO WATER HEATER.

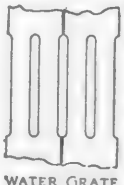
THE PRACTICAL TEST described as a little treatise on the Pierce down-draft boiler, is the title of a handsomely-printed manual, containing numerous colored plates, published by the Pierce, Butler & Pierce Mfg. Corporation of New York. After presenting a number of fac-simile letters from satisfied users, with photographic reproductions, in colors, of the homes themselves, the manual takes up the various features of the Pierce down-draft boiler. Under "the main feature" is given a description of the essential elements of the boiler. It is of the cast-iron sectional type, connected by push nipples. The end sections have extensions forming the side walls of the fuel magazine. A hollow casting, called the water front, forms the front wall. This is connected to the boiler proper by circulating pipes. The intermediate sections of the boiler form the rear wall of the magazine. Through the lower part of this rear wall are openings constituting the water grate. A series of draft openings is located in the lower part of the water front, opposite the water grate. The draft, therefore, passes directly across the fuel magazine, through the water-grate to the combustion chamber. The boiler is mounted on a base, forming an ash-pit and supporting a series of triangular shaking grate bars. The air for combustion does not pass through these grate bars, the real or effective grate being the water-grate. A number of illustrations, including a double-page perspective view, in colors, showing the boiler in full operation, are included, the catalogue concluding with price lists for nine sizes each of both steam and water types. Size 8½ x 11 in. Pp. 32.



CONSTRUCTION OF PIERCE DOWN-DRAFT BOILER.



DIAGRAMMATIC CROSS-SECTION OF PIERCE DOWN-DRAFT BOILER, ILLUSTRATING PRINCIPLE OF OPERATION.



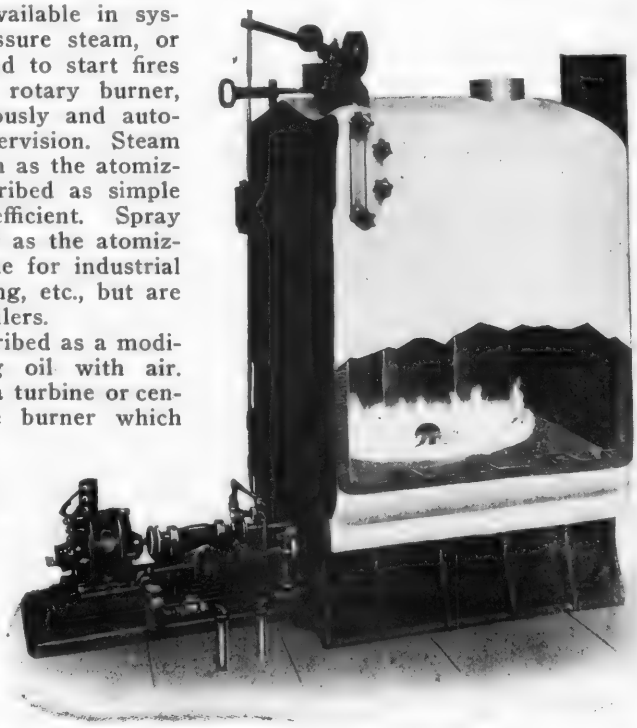
WATER GRATE FRONT VIEW

ILLINOIS HEATING SYSTEMS, including vacuum, vapor, and modulating systems of steam heating for office buildings, hotels, hospitals, schools, apartments, residences and manufacturing plants, are the subject of an impressive catalogue issued by the Illinois Engineering Co., Chicago, Ill., and devoted almost entirely to reproductions of the types of building mentioned which are equipped with Illinois heating systems. The illustrations are described as "a reel of achievement, not promise." The fact that the company manufactures a full line of steam specialties for the automatic control of steam, in addition to its special vacuum and vapor heating appliances, is mentioned as an added reason why it is able to use the proper device to secure desired results under the widely varying conditions of modern heating requirements. All Illinois heating systems are two-pipe systems. The principal device used is the Thermo return trap to automatically discharge air and water but prevent escape of steam to the return piping. The fact that this trap has a vertical seat is emphasized as giving it an advantage in making the trap positive in action and in preventing stoppage by dirt. The supply piping is also dripped through

automatic traps so that water-hammer and noise are prevented. It is also pointed out that all Illinois systems are closed systems, without air valves or pet cocks on the radiators, so that there is no possibility of odors and water drips. With the company's vapor system, the air is vented from the system through a special air vent check which operates at 2 to 3 oz. pressure. The widely-differing types of buildings shown in the catalogue and their distribution from coast to coast is an indication of the wide patronage enjoyed by the Illinois systems. Size 8 x 11 in. Pp. 88.

OIL—THE MODERN FUEL, featuring the Fess system for fuel-oil burning equipment for heat and power, is treated in a new catalogue issued by the Fess Rotary Oil Burner, Inc., Boston, Mass. Due to the coal famine last winter the company states that many owners had the courage to convert their plants to oil fuel with successful results. Under "Types of Oil Burners," the catalogue takes up vapor burners, rotary burners, steam atomizers, spray burners and turbine burners. Vapor burners are designed for the higher grades of petroleum, so are not practical for general domestic use. Rotary burners of the low-pressure, mechanical atomizing type, atomize a low grade of fuel oil by centrifugal force without the aid of compressed air or steam. These elements are not available in systems using vapor, low-pressure steam, or water, or when it is desired to start fires from a cold boiler. The rotary burner, however, operates continuously and automatically without skilled supervision. Steam atomizers require dry steam as the atomizing agent. They are described as simple in operation and highly efficient. Spray burners use compressed air as the atomizing agent and are adaptable for industrial plants for tempering, forging, etc., but are impracticable for steam boilers.

Turbine burners are described as a modified method of atomizing oil with air. Low-pressure air operates a turbine or centrifugal distributor in the burner which atomizes the oil and mixes this oil vapor and air. This type of equipment, it is stated, represents the most modern development of the art and is so designed to cover a wide range of application. The catalogue then takes up the Fess rotary oil burner for burning the lower grades of fuel in house-heating boilers. The equipment includes a fractional horse-power motor, worm reduction gear, oil pump, bevel-gear transmission, and rotary burner-head. In installing the equipment in a coal-burning boiler, the grate bars are removed and channel-iron supports substituted. On these is constructed a fire-hearth of fire-brick, set in high-temperature cement and asbestos. The fire-box is designed to premit a uniform distribution of the products of combustion and yet prevent the flame from impinging directly on the heating surfaces. In starting the plant the motor service switch is turned on and the oil pressure adjusted which immediately registers on the gauge. This pressure may be regulated by the pressure-regulating valve. Under this condition the oil is merely being drawn from and returned to the storage tank. When the desired oil pressure is attained, a lighted torch is placed on the furnace floor adjacent to the burner head. The hand-control valve is then opened, admitting oil which is immediately atomized and ignited. It continues to burn until the steam pressure or temperature within the system has reached a point at which the automatic control valve has been adjusted, when this valve will reduce the rate of combustion to meet the requirements. The construction of the Fess turbine burner is described in detail in the catalogue. Many



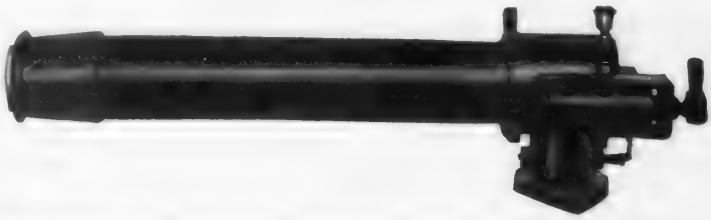
SMALL UNIT OF THE FESS ROTARY OIL BURNER UNDER A LOW-PRESSURE CAST-IRON SECTIONAL BOILER.

buildings equipped with Fess systems are shown, in the east as well as in the west. Size 8 x 11½ in. Pp. 44.

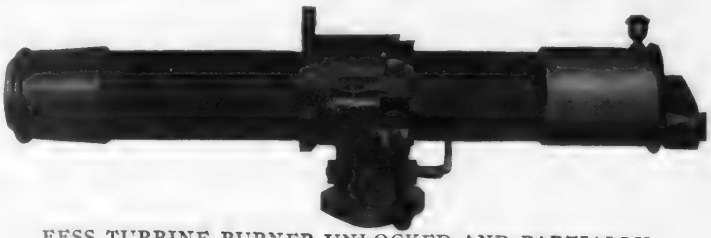
Improved Heater for Street Cars.

A heating and ventilating device for street cars, in which all sorts of fuel may be burned with a high intensity, has been developed by Walter E. Hinman and O. E. Quinton. It is being manufactured by the Detroit Stove Works under the name of the Jewel hot blast car heater.

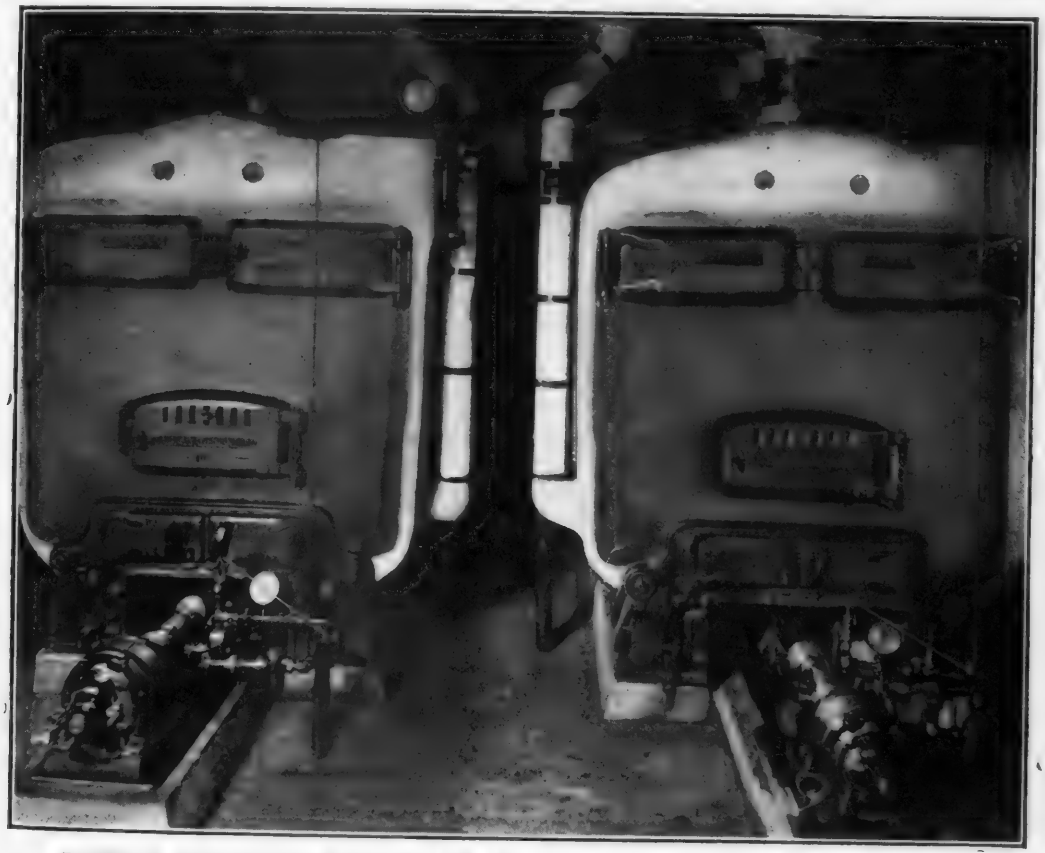
The heater has a tubular opening from the top of the stove to the fire bowl, permitting the entrance of fresh air by natural circulation. This arrangement, it is stated, permits complete combustion with nearly all sorts of fuel, including hard and soft coal, slack, siftings, coke or wood. The air supply originates at the aperture of the intake pipe in the roof of the car. The air is conducted down between the outer and inner shells of the stove pipe.



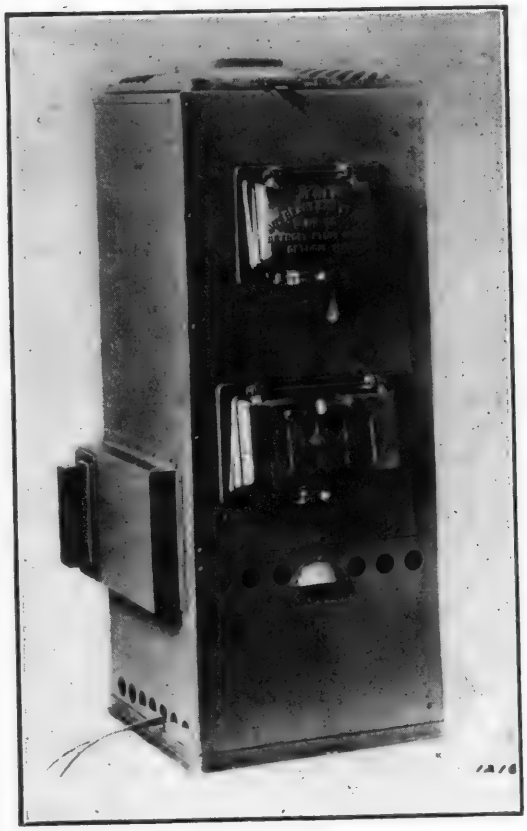
FESS TURBINE BURNER CLAMPED INTO FIRING POSITION.



FESS TURBINE BURNER UNLOCKED AND PARTIALLY WITHDRAWN FROM CASING.



BATTERY OF CAST-IRON SECTIONAL HEATING BOILERS EQUIPPED WITH FESS ROTARY OIL BURNERS.



JEWEL HOT BLAST HEATER FOR STREET CARS.

In passing downward the temperature of the air is raised about 40°. Baffle plates then guide the air around the fire-pot, causing effective circulation and delivery of the air into the car at a high temperature.

The number of castings used in the heater, it is stated, is but one-third the number used in other heaters for the same purpose, in all twelve being employed. The grate is flat. The heater is made in four sizes for the various sizes of cars.

The position of the motor and blower is unusual, being under the heater. It is claimed that this arrangement gives 30% greater air delivery and a higher temperature at the end of the heating duct. A Westinghouse motor of special design and a Sturtevant multivane type blower are used and for the prevention of down draft, a Garland weather-proof smoke jack is furnished.

Planning Houses for Workingmen.

One of the most complete reports ever issued in this country on the subject of planning of houses for workingmen has just been published by the United States Housing Corporation of the Department of Labor. The report deals exclusively with the architectural, town planning and engineering divisions of the corporation. It contains 544 pages and more than 200 cuts of house plans and elevations. It also contains the details of the town planning, architectural and engineering features and the statistics of 26,000 houses, the number originally planned by the Housing Corporation for war needs.

The report is of practical value to house-building corporations, architects, contractors and others. It may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C., for $1.50.

Roosevelt Memorial Campaign.

A memorial to Theodore Roosevelt in the form of a monument in Washington, and the development of a park in Oyster Bay which may ultimately include Sagamore Hill, Mr. Roosevelt's home, is being planned by the Roosevelt Memorial Association. This association was formed shortly after Mr. Roosevelt's death in response to a country-wide demand for such a memorial.

In order to carry the program to success the association will need a minimum of $10,000,000, and so that participation in the creation of this memorial fund may be general, subscriptions are being asked from millions of individuals. The campaign for the fund will be held in every State during the week of October 20-27 and will be directed from the office of the association, 1 Madison Avenue, New York. Checks should be sent to Albert H. Wiggin, Treasurer, at that address.

A Land Without Windows.

It is stated by the American Red Cross that doors, hinges and windows are among the things most urgently needed by the Roumanians for the reconstruction of the districts which were pillaged by the enemy. It is estimated that 20 square miles of window glass were smashed by the invading armies.

Bureau of Commercial Economics, an altruistic organization exhibiting educational films all over the world, has started a nation-wide campaign to get free motion picture theatres into factories, department stores, and, in fact, every place where there are workers. The bureau, which has the support of both this government and those of a number of foreign countries, is being directed by Dr. Francis Holley, 1600 Broadway, New York.

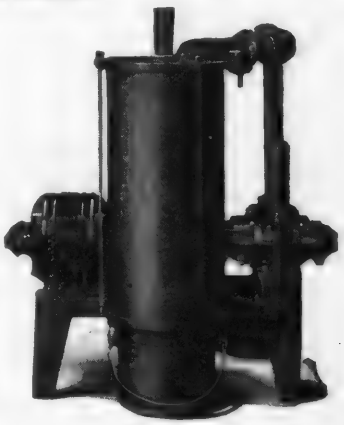
For Permanent Cleaning Equipment
specify the
ARCO WAND Vacuum Cleaner!

How a Building is Piped

Showing ARCO WAND Vacuum Cleaner with suction pipe having covered openings or inlets for hose connection in basement, first, and second floors. A strong suction swiftly and silently draws all dirt, fuzzy dust, paper bits, thread, lint, cobwebs, moths, bugs, germs, trash, etc., through the cleaning tool, hose, and pipe down into the sealed dust-bucket at bottom of machine. Above shows "Single Sweeper" ARCO WAND; also made as two sweeper for large buildings.

With the ARCO WAND you can specify cleaning requirements for the *smallest* residence or the *largest* business block. Factories, warehouses, apartments, theatres, churches, clubs, hotels—either new or remodeled buildings. Also made in truck type for cleaning large structures without piping.

Send for catalogs. We will be glad to co-operate and assist to specify ARCO WAND Vacuum Cleaners for buildings of any kind or size.



This cut illustrates type Numbers 341 and 361 ARCO WAND with electric motor direct drive

AMERICAN RADIATOR COMPANY

Sales branches and showrooms in all the large cities

VACUUM PUMP CONNECTIONS.

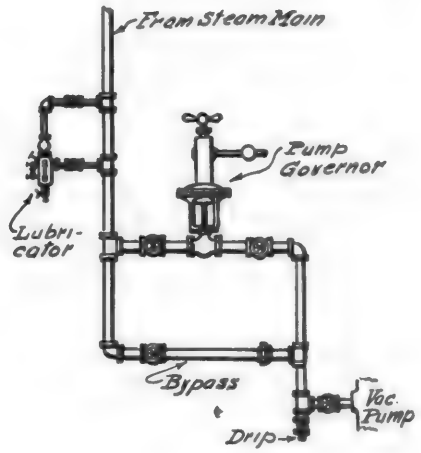


FIG. 1.

A vacuum pump, to produce the best results on a heating system, should maintain a vacuum of constant degree, the intensity of this vacuum being at all times under the immediate control of the engineer. In order to do this, some sort of automatic device is necessary.

The most satisfactory method so far developed is undoubtedly the scheme of inserting a pump governor in the steam line supplying the pump, as shown in Fig. 1, so that the pump will carry a constant vacuum on the suction line. This governor is operated by a small pipe (not shown) connected to the suction line, instead of to the discharge, as is the case with the regular pump-pressure regulator.

RADIATOR CONNECTIONS.

Runouts connecting radiators to risers even in vacuum systems should never be less than 3/4-in., even when the radiator return tapping is only 1/2-in.; when the runouts are over 5 ft. in length they should be made at least one size larger than the radiator tappings.

Direct radiator tappings, indirect radiator tappings and wall coils should be as follows, *based on E. D. R.*, and not on actual surface.

E. D. R. Square Feet	Condensation per Hour Lbs. of Water	Supply In.		Return In.
Up to 50	13	3/4 Rad.	3/4 Coil	1/2
Over 50 up to 100	25	3/4 Rad.	1 Coil	1/2
Over 100 up to 150	38	3/4 Rad.	1 1/4 Coil	1/2
Over 150 up to 175	44	1 Rad.	1 1/4 Coil	1/2
Over 175 up to 300	75	1 Rad.	1 1/2 Coil	3/4
Over 300 up to 632	158	— —	2 Coil	3/4
Over 632 up to 1100	275	— —	2 1/2 Coil	1

VAPOR HEATING

General.

NOTE.—*A vapor, vaccum, vapor-vacuum, vacuum-vapor, atmospheric, modulated or thermograde system of heating is considered as any system in which the steam pressure ordinarily carried is practically at atmosphere, or slightly below, or in which the returns are open to the atmosphere and where no pump or other positive mechanical device is employed to pull back the returns.*

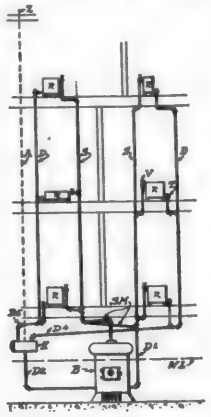


FIG. 1.

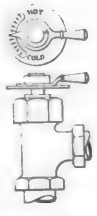


FIG. 2.

FIG. 3

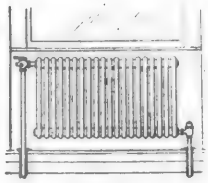


FIG. 4.

The vapor method of heating compares favorably both in economy and cost of installation with water. It responds quickly to increased or decreased draft, (i. e., it is easy to control) and possesses no large body of water which must be cooled or warmed in toto before a variation in the quantity of heat is obtained. During unseasonable warm days this system can be shut down and the radiators carried absolutely cold until such time as the outside temperature requirements may necessitate a re-opening of the drafts, and it absolutely avoids the danger of leaks from automatic air valves which is an item of considerable importance.

Referring to Fig. 1, the boiler B supplies steam to the steam main SM, this main supplying the steam risers S which may be either upfeed or downfeed, the radiators R shown being supplied by an upfeed system. The steam follows up the various risers to the graduated valves V on the radiators, these valves being the same as used on an ordinary vacuum system and having graduated control (so that certain portions of the radiator may be heated) such as ¼, ½, ¾ and full, as shown in plan and elevation, Fig. 2.

The steam enters the radiator through these valves and heats the proportion of surface approximately as indicated on the dial over which the pointer is placed.

To permit the steam to enter the radiator it is necessary for it to force a certain amount of air out of the radiator, all of this air passing out through the return, there being no air valves on this system. Therefore, the return valves T are what are known as "air and water-relief" valves, as shown in Fig. 3, being identical with the return valves used for radiators on strictly vaccum systems. In fact any sort of a trap passing both air and water may be used for this purpose.

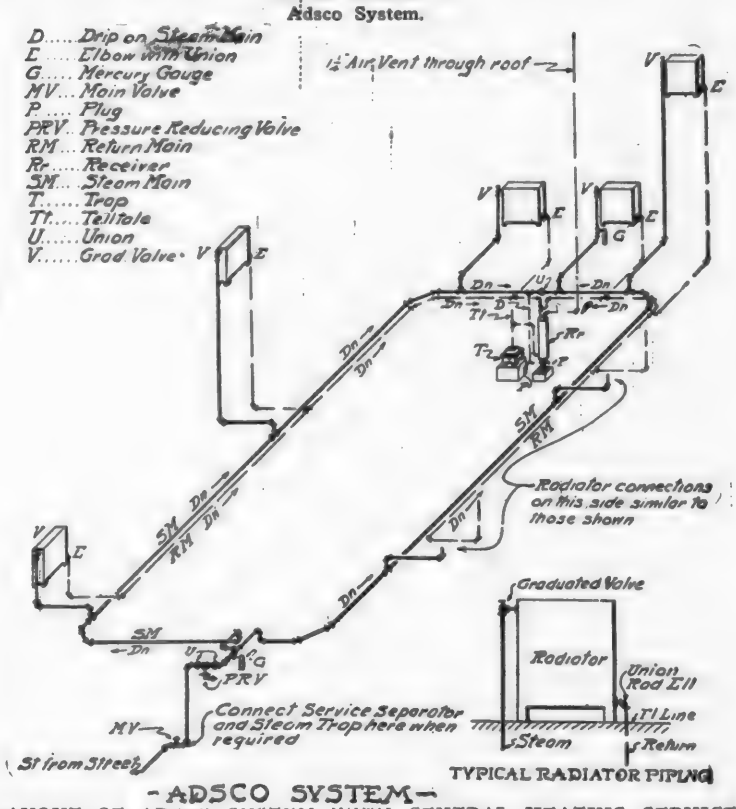
From this valve the air and water flow along the return main and into the tank X (Fig. 1) where the air relief line A leaves the top of the return tank X, this permitting the air to escape when it is caught between the return water and the water in the vertical boiler return pipe D-2. The air passes out through the vent pipe A which is carried through the roof at Z or to the atmosphere at some other convenient point. The condensation water then passes down through the boiler return pipe D-2 and enters the boiler B.

Where necessary to drip steam mains or low points of steam pipes on the radiator side of the return valve, drip lines must be installed and, in order to avoid a multiplicity of return valves, these drips are all connected into a horizontal line in the basement which is drained by a drip valve which discharges the water into the drip return D-4 or D-5, or with the boiler return D-2. Since the air finds its outlet entirely through the radiators it is not essential that the drip return be above the water-line, as the flooding of this pipe does not interfere with the air relief.

A typical radiator connection is shown in Fig. 4 and it will be noted that the radiators are the water type with a top connection on the supply side. This is not absolutely necessary but with leg radiators it is an advantage, making the graduated valves V more accessible than if they were located at the bottom of the radiator as is customary with ordinary gravity steam systems.

VAPOR HEATING.

Adsco System.



TYPICAL RADIATOR PIPING

-ADSCO SYSTEM-

LAYOUT OF ADSCO SYSTEM WITH CENTRAL HEATING SERVICE.

The Adsco system of atmospheric steam heating has been developed and perfected by the American District Steam Co. of North Tonawanda, N. Y. This system was one of the first of the many so-called "vapor" systems to be evolved and as such has had the ample opportunity of a long period of years to be perfected and brought to a final state of development.

The piping system as designed to suit central heating conditions is shown in the typical layout given in Fig. 1.

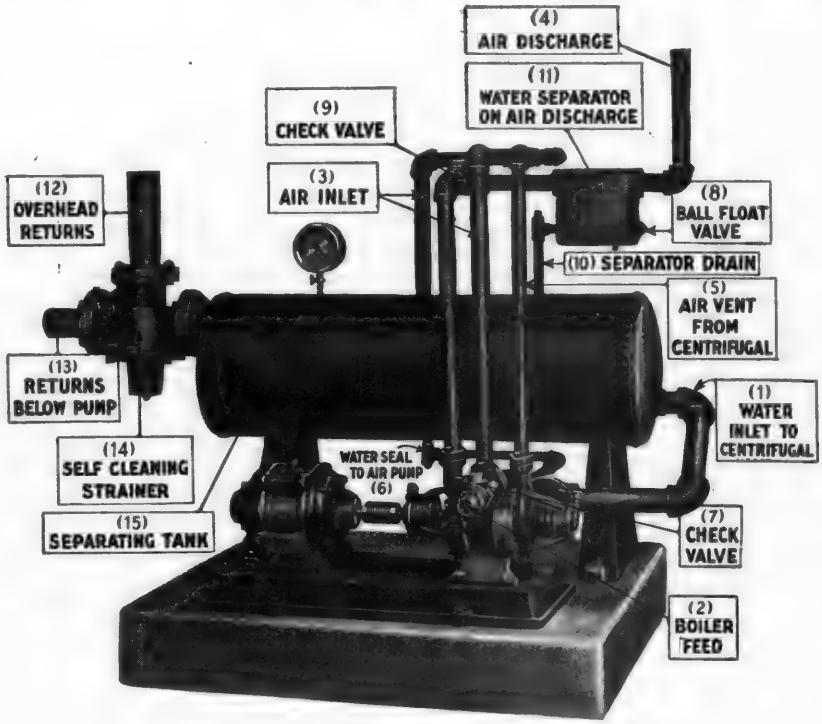
The steam when coming from the street is usually supplied at a pressure varying from 2 to 10 lbs. and the special reducing valve is arranged to reduce and maintain on the system a pressure sufficient to give 5 oz. at the radiator valves. The sizes of reducing valve recommended are two pipe sizes less than the diameter of the low-pressure-main; thus, a building requiring a 6-in. low-pressure main would be supplied by a 4-in. street connection and 4-in., or 4x6-in., reducing valve. The schedule of sizes recommended for 2 to 15 lbs. street pressure is as follows:

Radiation. Sq. Ft.	Size of Reducing Valve. Inches.
0 to 200	1 x 1½
200 to 300	1¼ x 2
300 to 600	1½ x 2½
600 to 900	2 x 3
900 to 1400	2½ x 3½
1400 to 2200	3 x 4
2200 to 2800	3 x 5
2800 to 3600	4 x 5
3600 to 6000	4 x 6
6000 to 8500	5 x 7
8500 to 11000	5 x 8

Straight valves with both inlet and outlet of the small size can also be used if desired.

(To Be Continued)

Efficient Heating
demands the JENNINGS PUMP



Size C for 26,000 square feet radiation, requiring only 2 H. P. Motor at 1,720 R. P. M., when delivering from a vacuum 10 inches mercury against a boiler pressure of 10 lbs.

The Jennings Pump consists of two independent turbine units, an air pump and a water pump, combined in one casing, with the impeller of each mounted on the same shaft.

One unit continuously exhausts air and vapors from the heating system, and the other removes the condensation as it accumulates and forces it directly into the boiler, or up to the hot-well.

The boiler pressure is against the water only. The air and vapor, representing approximately four-fifths of the volume handled, are delivered to the atmosphere *without back pressure. The saving in horse power amounts to over 50 per cent.*

The Pump is bronze fitted throughout. The shaft is tobin bronze. The air rotor, water impeller, lobe, port plate, sealing rings and clamping nuts are bronze. The shaft is supported on high grade annular ball bearings mounted outside of the pump casing.

Write for Bulletin No. 8

NASH ENGINEERING CO.

SO. NORWALK, CONN., U. S. A.

TRADE AND MISCELLANEOUS NOTES

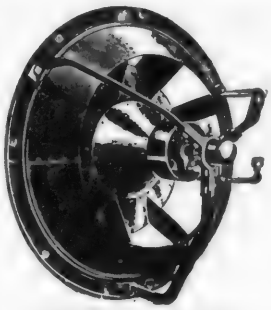
Miscellaneous Notes.

Jacksonville, Fla.—A heating campaign was recently conducted by the Jacksonville Gas Company, special attention being directed to a demonstration of "gasteam" radiators. This demonstration was in charge of G. W. Bean of James B. Clow & Sons, Chicago.

Decatur, Ill.—For the purpose of demonstrating the action of a warm-air heater, W. C. Jones of Decatur, has constructed a model two-story house of glass which has been placed on exhibition in the window of his place of business, 541 North Water Street. The house has eight rooms and is modern throughout. Every partition is of glass and the rooms are furnished with rugs and furniture. There are also electric lights and a bathtub. In the basement is a miniature Caloric furnace with a charcoal fire. Feathers in the rooms show the current created by the heat from the furnace. The house is about 5 ft. high, 4 ft. long and 3 ft. wide.

New York.—The uncertainty of the labor market in New York has held in abeyance a large number of building projects which will go forward as soon as the situation is stabilized. Among the efforts made to effect a settlement of the strike and lockout problem is an invitation extended by Governor Smith to employers and workers to participate in a conference with a view of developing a program and to appoint a State Labor Board of both employers and employees. The Building Trades Employers' Association has also called for a conference in view of the threatened lockout in the building trades.

Indianapolis, Ind.—Reports from the middle West are to the effect that building is very active, in spite of the high prices, the only drawback being the difficulty in some localities to procure materials.



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BLACKMAN FAN
Direct Connected to Motor

Building Operations for August, 1919, continue the favorable showing of the previous months. The figures for 153 cities, compiled by the *American Contractor*, indicate a gain of 267% over August, 1918. The gains shown by the more important cities are: Baltimore 227%, Chicago 5%, Cincinnati 273%, Cleveland 225%, Dallas 1297% ($2,427,615 from $174,291), Dayton 169%, Detroit 1079% ($8,767,135 from $743,515), Fort Worth 1553% ($3,414,190 from $206,480), Grand Rapids 137%, Indianapolis 179%, Kansas City 304%, Los Angeles 214%, Memphis 1107%, Milwaukee 228%, Minneapolis 572%, Newark 299%, New York City (Manhattan) 1586% ($26,193,275 from $1,553,437), Philadelphia 211% Pittsburgh 162%, Richmond 912%, Rochester 288%, San Francisco 195%, Seattle 69%, Sioux City 1588% ($2,013,415 from $119,250), St. Louis 442%, Toledo 251%, Washington 244% ($3,279,027 from $951,570), Worcester 206%, and Youngstown 404%. The following cities were the only ones reporting losses: Camden 73%, Charleston 40%, Des Moines 1%, Erie 22%, Fitchburg 50%, San Diego 74%, St. Joseph 37%, Superior 77%, and Wilkes-Barre 77%.

Norfolk, Va.—Plans for the first group of houses in the civic housing scheme to furnish homes to city employees at a rea-

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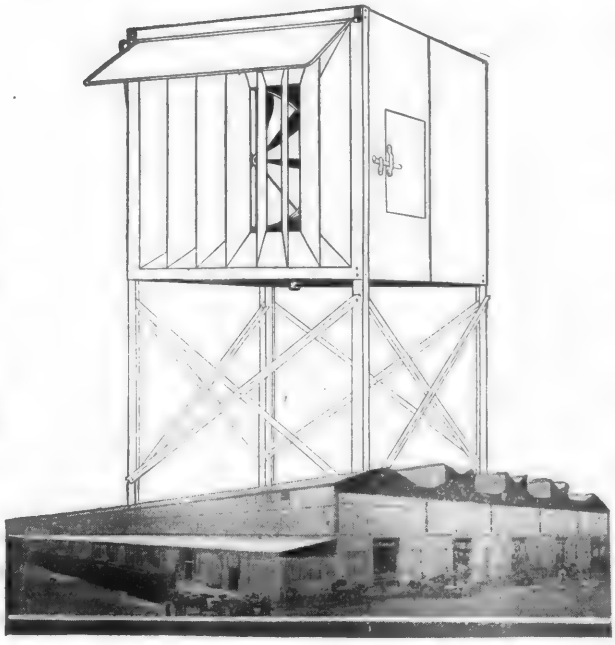

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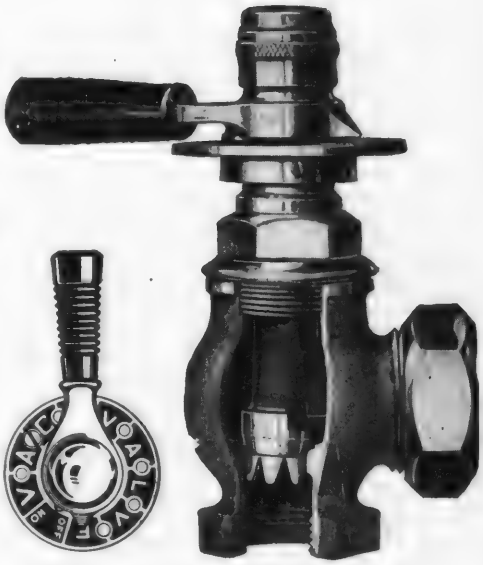
The Correct Radiator Valve for Vapor Heating

The Detroit Packless Vacu Valve is a Graduated Valve for Vapor and Vacuum Systems of Heating. The dial plate is provided with a series of holes and a movable pin. This pin acts as a stop for the handle pointer, and is inserted in the hole in the dial nearest the point at which the valve, when opened, admits only sufficient vapor or steam to fully supply the radiator.



DETROIT PACKLESS
Vacu Valve Showing Dial Plate and Lever Handle

Booklet VP-1 Gladly Sent Upon Request

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CANADIAN DETROIT LUBRICATOR COMPANY LTD. WALKERVILLE, ONTARIO

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HOUSING PROJECT AT NORFOLK, VA.

sonable rental have been completed and the construction work, it is announced, will be begun at an early date. The proposition includes the building of 20 five-room frame houses in Park Place on a triangular plot. The project will cost the city between $80,000 and $100,000. The twenty houses will be arranged both singly and in groups. The arrangement of the lots, grouping of the houses and the buildings themselves were designed by Calrow, Wrenn & Tazewell, architects. If this first proposition, which was suggested to the council by City Manager C. E. Ashburner, proves popular with the city employees, other grouping will be built by the city to supply homes for all those desiring them. The rentals charged will cover only the interest on the investment and insurance fees and no attempt will be made by the city to secure a profit on the investment. It is estimated by the city council that the houses can be rented for about $30.00 a month. A central heating plant is being

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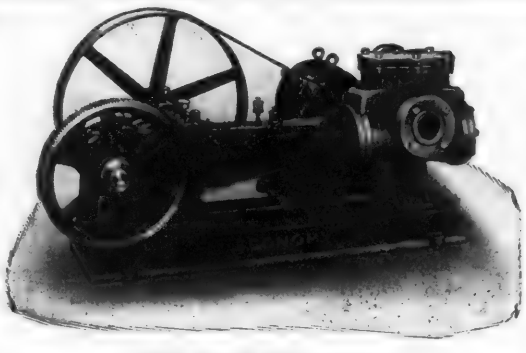

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WIN THE WAR—by steady work—full time—six days a week.—Secretary of Labor.

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

planned for the entire group. The city authorities hope to have the houses ready for occupancy by the first of the year.

Bureau of Standardization of materials used in the plumbing trade was formed at a meeting held in Chicago September 11 and attended by representatives of manufacturers, jobbers and master plumbers. Temporary officers were elected as follows: President, C. V. Kellogg, Chicago; first vice-president, J. E. Baggot, Chicago, second vice-president, Adolph Mueller, Decatur, Ill.; secretary, Paul Blatchford, Chicago; treasurer, J. R. Steneck, Chicago. Among the materials which the bureau will attempt to standardize are: cast-iron pipe and fittings, weights, sizes, etc.; screwed steel or wrought-iron pipe and fittings and galvanized iron pipe and fittings, weights, sizes, etc.; brass pipe and fittings; couplings, pipe threads, connections, flanges, bolts, etc.

Major J. W. M. Myrick, Boston, Mass., well-known in heating and ventilating circles, is the captain of the Massachusetts Civilian Rifle Team, which finished in seventh place in the recent national rifle match at Caldwell, N. J. The team was made up principally of men from the Ancient and Honorable Artillery Company and the Fusilier Veterans' Corps. The five leading teams represented the army, navy and marine corps, the latter taking first place. The Connecticut team, which secured sixth place, was the only State team to defeat the Massachusetts team. Fifty teams were in the competition.

Detroit Engineering Society, at its September meeting, discussed the new Detroit building code and the organization of the city's Building Department. The principal speaker was John C. McCabe, commissioner of buildings for Detroit.

American Malleable Castings Association has been formed to establish a uniformly high standard of quality by co-operative scientific research and education. The association is made up of malleable iron founders, with headquarters in Cleveland. Aside from the various laboratories of its members the asociation maintained at Albany a research department for investigation and experiment, and for the testing and analysis of the daily output of each member of the association. Impartial tests were made and the results, together with direction for improvement, where the need was indicated, were forwarded to the respective members. The association proposes to continue these daily tests and

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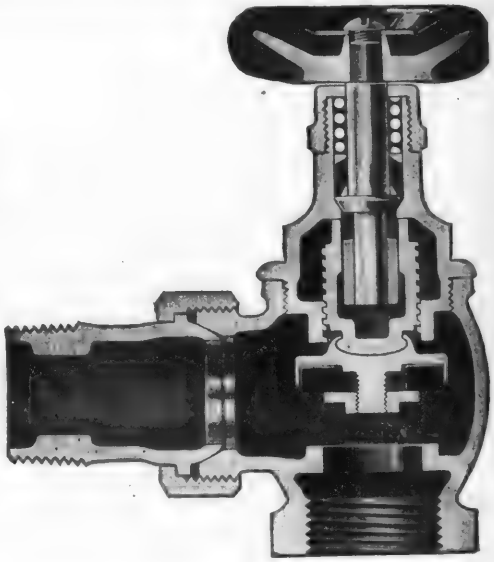
RE-ENFORCED
PACKLESS
VALVES

QUICK OPENING
Examine Construction Carefully

In this line of **Packless** and **Modulated Valves** the **Packless Feature** is, through **construction, special metal composition** of **Packless bearing** and a **packing cushion,** made **PRACTICALLY INDESTRUCTIBLE** and, **although a POSITIVE seal within itself,** it is the **ONLY** line in which the **Packless feature is, through a PACKING CUSHION** and a **very heavy special spring, AUTOMATICALLY RE-ENFORCED,** providing **TWO** or **DOUBLE, INDEPENDENT, POSITIVE,** bonnet seals for **ALL TIME.**

These Valves will withstand high pressures and, therefore, are of **superior value** for **vacuum** and **low pressure service.**



We **SPECIALIZE** on **high grade Radiator Valves** and **furnish** the **LARGEST LINE** of any company in the business.

Printed matter and prices on application

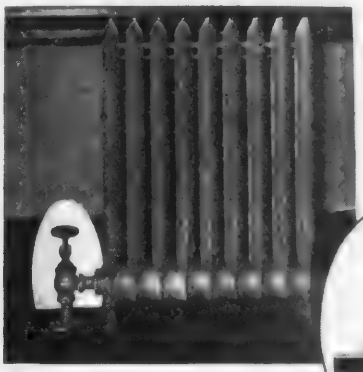
MARSH VALVE COMPANY, Erie, Pa.

analyses for the purpose of grading the product of each member. When a member's product has daily met the requirements of the prescribed standard for a period of three months, a "certificate of quality" will be issued to that member, who may then designate his output as "certified" malleable castings. These certificates will be renewed quarterly where the quality required is maintained. The association has issued a booklet on malleable iron and its production which may be obtained by addressing the association at 1900 Euclid Building, Cleveland, O.

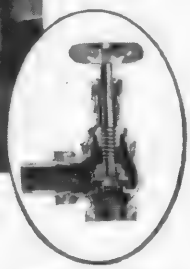
Central Station Heating Notes.

Palmyra, Ill.—A petition has been presented to the Illinois Public Utilities Commission by the Palmyra Light, Heat & Power Company for authority to increase its heating rates.

Decatur, Ill.—The city of Decatur is opposing the abolishing by the Decatur Railway & Light Company of flat rates for steam heating and the substitution of meter rates. The matter is now before the Illinois Public Utilities Commission.



Jenkins Radiator Valves are installed throughout the Woolworth Building.



JENKINS RADIATOR VALVES

—keep GOOD a good heating system.
—prevent spoiled ceilings, rugs or floors.
—eliminate dissatisfaction and "come-backs."

Put Jenkins Radiator Valves on a heating system and you have a job of satisfaction to yourself and client.

The construction of a Jenkins Radiator Valve is heavier and sufficiently strong to obviate any trouble that may arise.

Note the ample room in the bonnet for packing, and the uniform heavy construction throughout. Jenkins Radiator Valves are fitted with Jenkins renewable composition discs that give an absolutely tight contact on the seat.

JENKINS BROS.

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Jenkins Valves

A Johns-Manville Radiator Trap does not have to be adjusted after it is installed.

As a matter of fact, there is nothing to adjust nor to be tampered with.

This is true because temperature does not regulate the trap.

Condensation—water from the radiator which should be discharged—does.

HOW IT WORKS

It's a hollow copper ball that does the work. When there is no water to discharge, the ball is held against the discharge outlet. As water flows into the trap, the ball rolls up, exposing the outlet, and water is discharged. Any air that may be present is also drawn off. When the water level falls, the ball rolls down with it, preventing the loss of steam.

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10 Factories—Branches in 63 Large Cities

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JOHNS-MANVILLE
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JOHNS MANVILLE Radiator Trap

Springfield, Ill.—The State public utilities commission has ordered material increases in the rates for supplying central station heat in Virden, Carrollton and Charleston. In a recent order, the Central Illinois Service Company is denied the right to discontinue the operation of its heating plant until the close of the present season. The company at Virden is given permission to meter its electric heating and to charge sixty cents per 1,000 lbs. of steam, and shall furnish heat from September 15 to May 15 whenever the temperature outside is less than 60°.

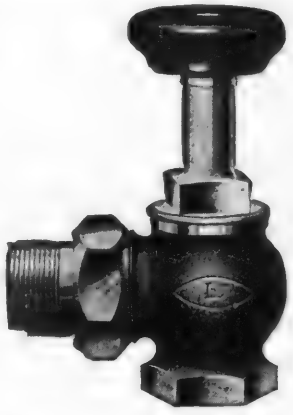
Revenues of the Virden company, the commission found, averaged less than 17 cents a square foot of installed radiation, "an extremely low rate for steam heating service." New rates increase the charges.

Both at Carrollton and Charleston, where the same company asked permission to discontinue service, the commission ordered that they supply heat at least until June 1. Until that time it is ordered that the company may increase the charges of 1918-1919 season 100%. On June 1, the company at Carrollton is permitted to discontinue service, but in Charleston the success of this season's service will determine the answer to the request.

Reinbeck, Ia.—F. W. Gates, who has been local manager of the Traer electric light and steam heating plant for the Iowa Railway & Light Company, has been transferred to Belle Plaine as manager of the company's interests at that point.

Peoria, Ill.—A petition has been filed with the State public utilities commission by the Jefferson Deposit Company, of Peoria, against the Central Illinois Light Company, concerning the heating and lighting of the Jefferson Building. It is set forth that in 1909 a contract was made for the term of twenty years for lighting and heating the building, with the Peoria Gas and Electric Co. The provisions of this contract were carried out by the Central Illinois Light company, successors to the Peoria Gas and Electric company, until September, 1918, when, it is alleged without notice, a higher rate was put in force, which was paid under protest. It is set forth that there is now pending a petition for still further increasing the rates which, if allowed, will cost the Jefferson building $50,000 during the remainder of the life of the contract. The Jefferson building owners have not been made a party to rate proceedings, despite their contract, for as

For Your Own Good



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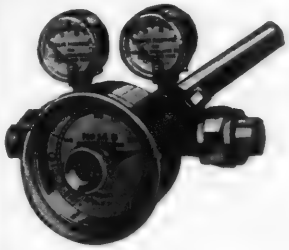
for the good they can do on your good jobs because of the good principle and workmanship which is built into every valve.

They are BUILT RIGHT—TO STAY TIGHT.
They positively do not leak Water, Steam or Air.
They open quickly and close just as quick.
They are an ornament and a faithful servant to any job.

Made in six sizes, many styles of handle.

All good jobbers have them

COMMONWEALTH BRASS CORPORATION, Detroit, Mich.



Powers No. 14B Regulator

This regulator is used in various processes in the industrial field, where heating and cooling mediums demand automatic control which must be accurate and unfailing.

Ask for Bulletin 132

Where Can I Save?

That's the big problem facing the Engineer today; and Automatic Temperature Control is the answer, in many cases.

Manual heat control in heating, cooking, or cooling processes is a prolific source of waste. At best it only corrects wrong conditions, and besides, labor is high.

Automatic Temperature Control prevents wrong conditions, stops waste, and saves its cost quickly.

We have been solving problems with Automatic Temperature Control for more than thirty years. The vast amount of practical experience gained is at your service without charge.

The Powers Regulator Co.
Specialists in Automatic Heat Control

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CONTROLLING the inflow of tempered air and the exhaust of vitiated air is easy with the

PERFECTO DAMPER REGULATOR and INDICATOR

May be placed on the wall where the ventilating ducts are concealed and the damper connected to it by an extension of the square damper rod. Cannot be altered except by person in charge. Especially useful in schoolrooms.

Send for bulletin giving further particulars

THE SIXTH CITY SHEET METAL WORKS CO., Cleveland, O.

Galvanized Iron Work for Heating and Ventilating Systems

far back as November, 1917, of which the present status of affairs is the outcome and seeks to recover several thousand dollars already paid in excess rates over their contract. The Jefferson company cites recent decisions of the supreme court and an amendment to the public utility law passed in June, 1919, to substantiate their contention of the validity of their contract. This is the first case of the kind at issue.

Taylorville, Ill.—A muncipally-owned heating and lighting plant has been proposed by Mayor Downey of Taylorville to be placed in operation as soon as the franchise of the Central Illinois Public Service Company expires next June. This action is being urged as an answer to the alleged excessive heating rates being charged by the service company. The company recently served an ultimatum upon its customers in Taylorville that it was about to install steam meters by which the charges would be reckoned in the future. Figures submitted by the company showed that it lost money last year on the old flat rate, plus 60%.

Springfield, Mo.—The new rates for steam heat in Springfield, promulgated by the Missouri Public Service Commission, are declared by J. T. Woodruff, owner of the

WEBSTER
Air Conditioning
Apparatus

FOR

Generator and Transformer Ventilation

is the subject of Bulletin No. 450 just off the press, which, in connection with Bulletin No. 540, entitled

Ventilation Systems for Steam Turbine Alternators

forms a most complete piece of literature on the subject.

In writing for copy please state whether you have or wish copies of Bulletins No. 50 and No. 120—

How to Specify Webster Air Washers

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The "Little Draft-Man"

Has Been a Money Maker

Are You One of the Dealers Who Profited?

IT is not too late. We are open for representation at points where business will be good with this appealing furnace regulator. Our sales have demonstrated the demand for a simple device by which people can regulate their furnaces on the living-room floor without having to go downstairs every time they want to start up the fire or check it.
The "Little Draft-Man" fulfills the requirements unfailingly. It connects with any make of furnace, old or new, and is easily installed. It has no electrical connections, and it stays in order. Its price is another reason for its popularity.

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Get details of our proposition to dealers. Their margin of profit makes this device worth their best sales efforts. If interested, write us *today*.

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Architects: Palmer & Hornbostel, New York City
Heating Engineer: H. C. Meyer, Jr., New York City

IN many cities the buildings belonging to the municipality and housing the municipal departments are a grave reflection upon the taste and judgment of those responsible for their appearance and arrangement.

The city of Oakland, California, however, is an exception. Here is a classic city hall, an example of the splendid architecture of the Golden West.

In keeping with the far-seeing arrangement for utility and healthful conditions in every section of the building, the "Sirocco" system of heating and ventilating has been installed. This means dependable service with healthful heating when needed, and a system of ventilation insuring fresh, clean air at all times.

If you are interested in any heating or ventilating proposition, we would like to talk with you.

AMERICAN BLOWER COMPANY
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Woodruff Building, as "the most radical increase in cost of any public service commodity Springfield has ever experienced." Mr. Woodruff stated that the new rate will be an increase of 64.7% over the rate charged last year, and an increase of 105.8% over the rate of 1918. According to E. C. Deal, general manager of the Springfield Gas & Electric Company, the findings of the commission showed that even wth the increased rates a loss of $1,414.03 will be suffered by the company each year, without allowing anything for interest on investment or for depreciation. On the application of a number of business men a rehearing of the ruling fixing the new heating rates has been granted.

Rock Island, Ill.—Aledo consumers will not be forced to meet an advance in heating rates this winter, according to action taken by the State public utilities commission in the applicaton of the Northern Utilities Company. The company petitioned for an increase approximately doubling the rate now in force, but the commission suspended action until next March. The present rate is 75 cents per 1,000 lbs. of condensation as a basis.

Manufacturers' Notes.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., has announced the award of the four annual war memorial scholarships of $500.00, to the following: Herbert S. Pahren, Cincinnati, O.; Arthur Martens, Paul O. Langguth, and Andrew P. Lesniak, all of East Pittsburgh. Two classes of scholarships are provided, based on competitive examinations. The first class is for sons of employees of the company or its subsidiaries who have been employed for five years or more. The second class is for employees who have been continuously employed for at least two years and who are not over 23 years old. Each scholarship carries with it an annual payment of $500.00 for a period not to exceed four years, the payment to be applied toward an engineering education in any technical school or college. These scholarships have been established as a memorial to those employees who entered the service of the country during the war. Four awards will be made each year.

United States Radiator Corporation, Detroit, Mich., has moved its Kansas City

The Engineer of the Near Future

will be expected to know exactly what his client means when he says "I want Manufactured Weather for the entire building. I want to make 'Every day a *good* day.' "

If you are not yet familiar with Manufactured Weather I'll be glad to send you my new book, "Weather, and the Story of How it is Manufactured."

It's gratis, of course.

Write right now!

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Yours to make

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"Every day a good day"

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Buffalo
Equipped
THE prominent buildings in all parts of the country are equipped with
Buffalo Heating and Ventilating Apparatus
It puts heat, mechanically, just where it is wanted, keeps it in circulation and prevents it from escaping through the ventilators in in the roof until it has been used to the best advantage. Saves coal—increases efficiency of workers.
Catalog No. 198-36 gives valuable engineering data on heating and ventilating problems and our engineering department is always available for consultation.
Buffalo Forge Company
Buffalo, N. Y.
Offices in all Principal Cities
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branch to its new office and warehouse at 1412-1414 West Twelfth Street, Kansas City. The new warehouse is a five-story building, with a frontage of 50 ft. and a depth of 100 ft. The structure has a floor space of 30,000 sq. ft. R. W. Hillman is manager of the branch.

Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., is building a three-story buff brick building on Braddock Avenue, adjacent to its two main shop entrances, which will be equipped as a modern cafeteria and restaurant, seating over 3,000 persons and providing food on a "service at cost" basis. The company employs 20,000 workers at its East Pittsburgh plant. Work on the new structure is progressing under the direction of Bernard H. Prack, the architect in charge. It is expected to open the restaurant by January 1.

New Incorporations.

Massachusetts Steam Specialty Co., Cranston, R. I., to manufacture steam specialties. Among the principals is Wallace E. Tillinghast.

Winhar Mfg. Corporation, New York, capital $250,000, to manufacture steam and water heating boilers. Incorporators: G. E. Baer, D. S. Brower and F. A. Barry, 283 Flatbush Avenue, Brooklyn, N. Y.

William G. Miller & Co., Detroit, Mich., capital $11,000, to conduct a heating, pluming, hardware and building supply business.

Mineral Point Heating Co., Mineral Point, Wis., capital $12,000, to operate a heating plant for commercial purposes. Incorporators: W. J. Penhallegon, John W. Chambey and Charles L. Ivey.

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One No. 8 Double-Width

Multivane Blower

NIAGARA CONOIDAL TYPE
Manufactured by the Buffalo Forge Co.

Has been used about one year. In perfect condition bearings in first-class order.

Price $500.00
F. O. B. Dunedin

SKINNER MACHINERY CO.
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Heating
Drying
Engines

Ventilation
Air Washers
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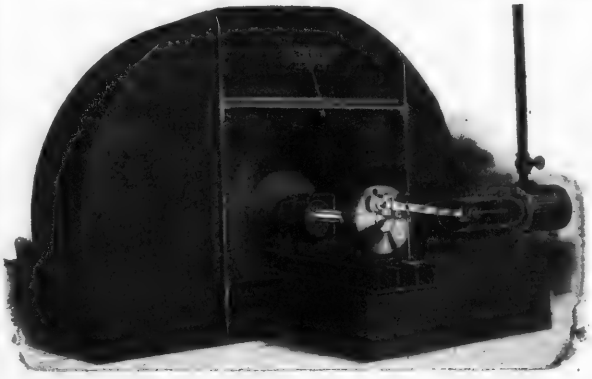

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THE UNIT HEATER

was first placed in use in 1870 by B. F. Sturtevant, founder of the B. F. STURTEVANT COMPANY. Since that time, through careful study and engineering pratice, the present day Portable Unit Heater has been perfected. It is just one of the large and growing family of

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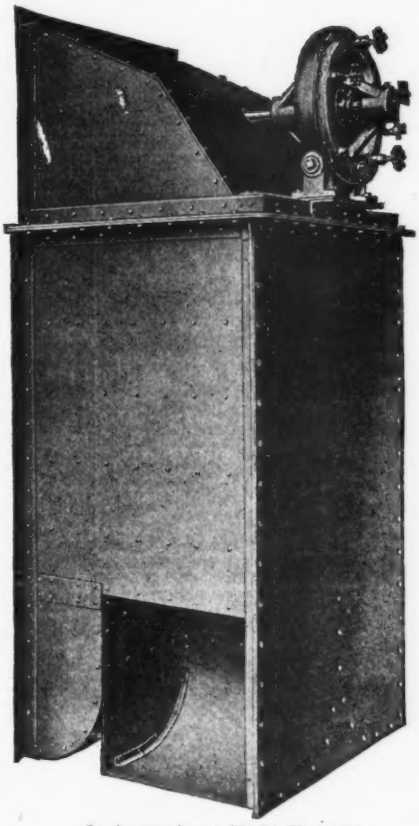

Independent Unit Heater

Its relation to the heating of shops and factories is similar to replacement of the old line shafting, by the unit motor drive.

It eliminates expensive, cumbersome overhead piping; it warms just the portion you wish heated; the exhaust steam from the small turbine, driving the disc or propeller fan, heats the steam coils. Its economy is apparent, and its efficiency has been proven.

The following are typical users:

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Our Engineering Staff, with the benefit of this fifty years of experience is at your service. Estimates given without obligation.

B. F. STURTEVANT COMPANY

Hyde Park, Boston, Mass., U. S. A.

AND ALL PRINCIPAL CITIES

National Asbestos Mfg. Co., Jersey City, N. J. Capital $1,500,000, to manufacture pipe covering. Incorporators: Edward T. Connell, Curt R. Burkhardt and John A. Scharwarth.

$10,000,000 Endowment Fund Campaign for Massachusetts "Tech."

The Massachusetts Institute of Technology has launched a $10,000,000 Endowment Fund Campaign. It is the boast of this great technical school that it turns out industrial leaders. But it charges its students $300.00 for a year's education which actually costs $500.00. The tuition, it is felt, must not be raised, as that would bar the way for many young men who want technical educations. Neither can the cost be lowered. Believing that the "Tech" type of education is of vital importance to the industrial America of the future, a "mysterious Mr. Smith" has started the ball rolling with a promise of $4,000,000, provided the alumni and friends of the institute raise another $4,000,000.

During the war, it is stated, 70% of the thousands of "Tech" men who entered the service became officers. The courses given by the institute in physics, electrochemistry, electrical and sanitary engineering, it is added, are turning out year by year men thoroughly trained to deal in a big, constructive way with a wide variety of engineering problems, including those of the heating and ventilating industries. An example of this is furnished by the career of Benjamin Stearns Hinckley, 99, for many years "engineer of tests" on coal with the New Haven and Boston & Maine railroads, and recently assistant to Fuel Administrator Garfield.

The proposed endowment fund, it is estimated, will enable the institute to cope with the high cost of living and to expand to meet its present opportunity.

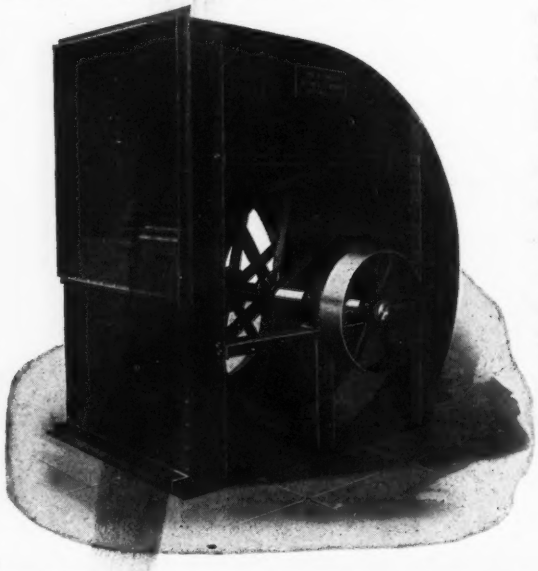
Peoria, Ill.—An appropriation of $10,500 for installing a vacuum heating plant in the court house in Peoria has been recommended by the finance committee of the city council. The court house at present is heated by the plant in rear of the jail and is considered obsolete.

New Firm.

Horace G. Cooke, Inc., New York, has been organized to design and market for the National Marine Engine Works a complete line of rotary compressors, gas exhauster and pumps. Mr. Cooke, the organizer of the new company was for twenty years eastern representative of the Con-

Buckeye Multiblade Fans

are made especially for low pressure Heating and Ventilating work. They are giving perfect satisfaction.



CORRECT DESIGN. HEAVY CONSTRUCTION, NOISELESS OPERATION, WORKMANLIKE FINISH, HIGHEST EFFICIENCY.

Our Engineering Department is maintained for the purpose of assisting Engineers, Architects, etc., in planning efficient Heating and Ventilating Systems for all buildings.

THIS DEPARTMENT IS FREE TO YOU.

We also manufacture a complete line of Disc, Cone and Steel Plate Fans.

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The Engineer *for this* Building has picked Massachusetts Fans *because*-

Astor Trust Bldg., New York City
Architect, Montague Flagg
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Massachusetts Squirrel Cage Fans combine exceptionally high operating efficiency with a ruggedness and durability of construction that reduces both the operating and upkeep expense to a minimum.

No fans give a higher degree of satisfaction than do Massachusetts Squirrel Cage, hence the large number of public and industrial buildings heated and ventilated by Massachusetts apparatus.

MASSACHUSETTS BLOWER CO.
Watertown **Mass.**

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MASSACHUSETTS FANS

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nersville Blower Company. Executive and sales offices have been opened at 50 East 42nd Street.

Wanted—Heating and ventilating engineer draftsman. Must have college education, be neat draftsman, capable of designing hot air, heating and ventilating systems. In reply state college, course and number of years attended, age, experiences, references, present salary and salary expected. Location, Eastern New York. Address Box No. 20, care of HEATING AND VENTILATING MAGAZINE.

RIC-WIL Paint for Heated Surfaces

A brilliant black paint of superior preservative properties, dries hard yet is tough and elastic. It has a bond with clean metal that preserves its adhesion during contraction, expansion and bending.

Lasts Much Longer than the Average Coating.

Especially Good for Underground Heating Pipes.

Let us send You a Free Sample to Test.

THE RIC-WIL COMPANY, Cleveland, O.

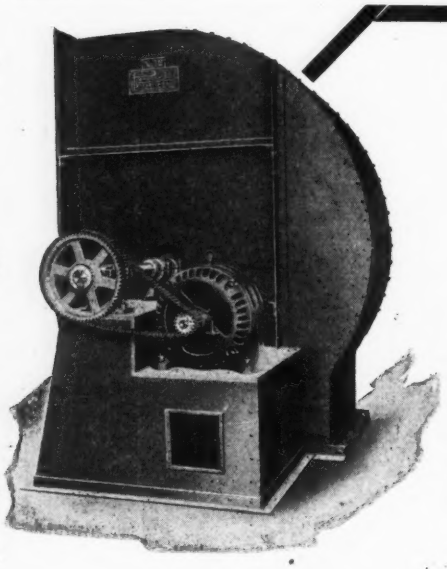
WANTED.

Position Wanted.—Designing, estimating and supervising engineer for heating, ventilating and power plants. Broad practical experience, office and field. Alert, accurate, resourceful. Thorough technical and business training. Address A. B. C., care of Heating and Ventilating Magazine.

Wanted—Draftsman familiar with plumbing, heating and ventilating and general plant piping. Address the Herbold Co., 310 Vicary Building, Canton, O.

Wanted—One of the largest mid-western warm-air furnace organizations wants a competent draftsman and heating engineer, capable of figuring fan and gravity systems and large public building work. Must be competent to figure, plan and superintend installation. Knowledge of hot water and steam heat and figuring is desirable, but not essential. Salary consistent with capacity. State all particulars first letter. Address Morton, care of Heating and Ventilating Magazine.

Wanted—An experienced estimator who can make estimates for power piping, heating and ventilating installations. Must be accurate. Give experience, age, qualifications and salary desired. Permanent position. Address Southworth, care of Heating and Ventilating Magazine.



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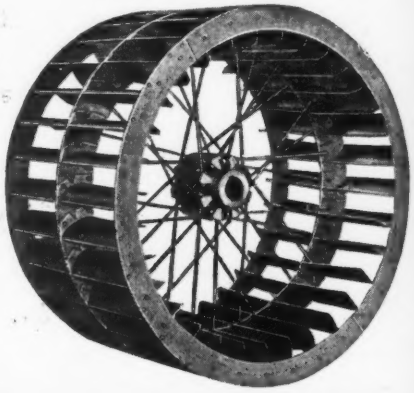
They will help you solve many heating and ventilating problems—but we'll gladly go farther and submit plans and estimates for buildings with whose erection and equipment you are concerned.

Bayley Plexiform Fans provide maximum air delivery against low or medium high resistance from a minimum of housing. Chinook Heaters provide positive circulation and prevent short circuiting of steam. Every square foot is prime heating surface.



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BAYLEY MFG. COMPANY

732 Greenbush St., Milwaukee, Wis.

Builders of Heating, Ventilating, Drying and Exhaust Systems